THE ACCOUNTING REVIEW

VOLUME 82, No. 2 MARCH 2007

KATHERINE SCHIPPER
Required Disclosures in Financial Reports

MARY ELLEN CARTER, LUANN J. LYNCH, and İREM TUNA
The Role of Accounting in the Design of CEO Equity Compensation

MERLE M. ERICKSON and SHIING-WU WANG
Tax Benefits as a Source of Merger Premiums In Acquisitions of Private Corporations

KOROK RAY
The Retention Effect of Withholding Performance Information

EVELYN R. PATTERSON and J. REED SMITH
The Effects of Sarbanes-Oxley on Auditing and Internal Control Strength

K. R. SUBRAMANYAM and MOHAN VENKATACHALAM
Earnings, Cash Flows, and *Ex Post* Intrinsic Value of Equity

NICOLE THIBODEAU, JOHN H. (HARRY) EVANS III, NANDU J. NAGARAJAN, and JEFF WHITTLE
Value Creation in Public Enterprises: An Empirical Analysis of Coordinated Organizational Changes in the Veterans Health Administration

JUN HAN and HUN-TONG TAN
Investors' Reactions to Management Guidance Forms: The Influence of Multiple Benchmarks

A JOURNAL OF THE
AMERICAN ACCOUNTING ASSOCIATION

AMERICAN ACCOUNTING ASSOCIATION

The members of the 2006–2007 Executive Committee of the Association are as follows:

President	Shyam Sunder, Yale University
President-Elect	Gary John Previts, Case Western Reserve University
Vice President	James E. Hunton, Bentley College
Vice President–Education	Nancy A. Bagranoff, Old Dominion University
Vice President–Finance	Joseph V. Carcello, The University of Tennessee
Vice President–International	Alfred Wagenhofer, Universitat Graz
Vice President–Professional Relations	D. Scott Showalter, KPMG
Vice President–Publications	Morton P. Pincus, University of California, Irvine
Vice President–Research	Arnold M. Wright, Boston College
Vice President–Sections and Regions	Mark M. Higgins, University of Rhode Island
Past President	Judy D. Rayburn, University of Minnesota

The American Accounting Association was founded in 1916 as the American Association of University Instructors in Accounting. Its present name was adopted in 1936. The Association is a voluntary organization of persons interested in accounting education, research, and practice. Full membership entitles one to receive Accounting Education News, a selection of one, two, or all three of the Association-wide journals (*The Accounting Review, Accounting Horizons,* and *Issues in Accounting Education*) and the opportunity to purchase Association publications at a discount.

Membership in the Association is available at the following annual rates:

Full membership:
The membership dues include online selection of one, two, or all three of the following Association-wide journals: *The Accounting Review, Accounting Horizons,* and *Issues in Accounting Education.* (This does not include Section journals.) Beginning September 1, 2006 the print option includes hard copy of the journals selected.

Select one Association-wide journal	U.S. $155.00	with Print Option $175.00
Select two Association-wide journals	U.S. $165.00	with Print Option $185.00
All three Association-wide journals	U.S. $175.00	with Print Option $195.00

Student membership:
The print option is not available for student members.

Select one Association-wide journal	U.S. $25.00
Select two Association-wide journals	U.S. $35.00
All three Association-wide journals	U.S. $45.00

In addition, full members may belong to one or more Sections: Accounting, Behavior and Organizations; Accounting Programs Leadership Group; American Taxation Association; Artificial Intelligence/Emerging Technologies; Auditing; Financial Accounting and Reporting; Gender Issues in Accounting; Government and Nonprofit; Information Systems; International Accounting; Management Accounting; Public Interest; Teaching and Curriculum; and Two-Year College. Each Section assesses its own annual dues, which are collected by the Association.

Editorial correspondence and all manuscripts should be emailed to TARUAZ@email.arizona.edu or sent to Professor Dan Dhaliwal, Senior Editor. *The Accounting Review,* The University of Arizona, Department of Accounting, McClelland Hall 301, 1130 E. Helen Street, Tucson, AZ 85721-0108.

The submission fee of $125.00 for members of the AAA or $200.00 for nonmembers should be paid online (VISA or MasterCard only) at: https://aaahq.org/AAAforms/journals/tarsubmit.cfm and must be paid when article is submitted. Request for reprint permission, subscriptions, advertisements, and dues should be sent to American Accounting Association, 5717 Bessie Drive, Sarasota, FL 34233-2399 • Telephone: (941) 921-7747 • Fax: (941) 923-4093 [illegible] Email: Office@aaahq.org. Notice of change of address should be mailed at least eight weeks in advance to ensure undelayed receipt of *The Accounting Review.*

The Accounting Review (ISSN 0001-4826 print and ISSN 1558-7967 online) is published five times a year in January, March, May, July, and October by the American Accounting Association, 5717 Bessie Drive, Sarasota, Florida 34233-2399. General subscriptions are available at the annual rate of U.S. $300; membership subscription rate is $25 with discounts available; and emeritus subscription rate is $8.75. Periodical postage paid at Sarasota, Florida and additional mailing offices. **POSTMASTER:** Send address change to *The Accounting Review,* 5717 Bessie Drive, Sarasota, Florida 34233-2399.

© 2007 American Accounting Association. All rights reserved. Printed in the United States of America.

THE ACCOUNTING REVIEW

A JOURNAL OF THE
AMERICAN ACCOUNTING ASSOCIATION

Senior Editor
Dan S. Dhaliwal
Editors
John E. Core
Steven J. Huddart
William Kinney
Marlys Gascho Lipe
William E. McCarthy
Mark W. Nelson
Madhav Rajan

39

VOL. 82 MARCH 2007 No. 2

KATHERINE SCHIPPER
Required Disclosures in Financial Reports 301
MARY ELLEN CARTER, LUANN J. LYNCH, and İREM TUNA
The Role of Accounting in the Design of CEO Equity Compensation 327
MERLE M. ERICKSON and SHIING-WU WANG
Tax Benefits as a Source of Merger Premiums In Acquisitions of Private Corporations 359
KOROK RAY
The Retention Effect of Withholding Performance Information 389
EVELYN R. PATTERSON and J. REED SMITH
The Effects of Sarbanes-Oxley on Auditing and Internal Control Strength 427
K. R. SUBRAMANYAM and MOHAN VENKATACHALAM
Earnings, Cash Flows, and *Ex Post* Intrinsic Value of Equity 457
NICOLE THIBODEAU, JOHN H. (HARRY) EVANS III, NANDU J. NAGARAJAN, and JEFF WHITTLE
Value Creation in Public Enterprises: An Empirical Analysis of Coordinated Organizational Changes in the Veterans Health Administration 483
JUN HAN and HUN-TONG TAN
Investors' Reactions to Management Guidance Forms: The Influence of Multiple Benchmarks 521
Editorial Data 545
Editorial Policy and Style Information 547

P 30815

Editorial Staff of *The Accounting Review*
2006–2007

SENIOR EDITOR
Dan S. Dhaliwal, The University of Arizona and The University of Auckland

EDITORS
John E. Core
Steven J. Huddart
William Kinney
Marlys Gascho Lipe
William E. McCarthy
Mark W. Nelson
Madhav Rajan

EDITORIAL ASSISTANT
Gail Emily Fey, The University of Arizona

American Accounting Association

EXECUTIVE DIRECTOR
Tracey E. Sutherland

COMMUNICATIONS DEPARTMENT
Beverly Harrelson
Diane Hazard
Lisa Habblitz
Kathy Casper
Judy Cothern
Jan Kovarik (subcontractor)
Marcia Craig (subcontractor)
Lorene Porte (subcontractor)

OTHER AAA STAFF
Debora Gardner
Peggy Turczyn
Renie Knights
Pat Stein
Arlene Oliver
Roland LaTulip
James Szelminski
Mary Cole
Barbara Brady
Joe Barciniak
Deirdre Harris (subcontractor)

Editorial Advisory and Review Board

Shannon W. Anderson, Rice University
Anil Arya, The Ohio State University
Hollis (Holly) Ashbaugh-Skaife, University of Wisconsin–Madison
Ramji Balakrishnan, The University of Iowa
Tim Baldenius, Columbia University
Orie E. Barron, The Pennsylvania State University
Sudipta Basu, Emory University
Anne L. Beatty, The Ohio State University
Daniel A. Bens, The University of Arizona
Jennifer Blouin, University of Pennsylvania
Robert J. Bloomfield, Cornell University
James R. Boatsman, Arizona State University
Christine A. Botosan, University of Utah
Mark T. Bradshaw, Harvard University
Brian J. Bushee, University of Pennsylvania
Jeffrey L. Callen, University of Toronto
William M. Cready, The University of Texas at Dallas
Patricia M. Dechow, University of Michigan and University of California, Berkeley
Mark L. DeFond, University of Southern California
Hemang Desai, Southern Methodist University
Sunil Dutta, University of California, Berkeley
Merle M. Erickson, The University of Chicago
Leslie G. Eldenburg, The University of Arizona
Paul E. Fischer, The Pennsylvania State University
Jennifer Francis, Duke University
Jere R. Francis, University of Missouri–Columbia
Jennifer J. Gaver, University of Georgia
Frank B. Gigler, University of Minnesota, Twin Cities Campus
Dan Givoly, The Pennsylvania State University
Cristi A. Gleason, The University of Iowa
Jonathan C. Glover, Carnegie Mellon University
Michelle Hanlon, University of Michigan
R. Lynn Hannan, Georgia State University
Rachel M. Hayes, University of Utah
D. Eric Hirst, The University of Texas at Austin
Frank D. Hodge, University of Washington
S. Paul Hribar, Cornell University
Christopher D. Ittner, University of Pennsylvania
Bruce W. Johnson, The University of Iowa
Karla M. Johnstone, The University of Wisconsin–Madison
Kathryn Kadous, Emory University
Sanjay Kallapur, Purdue University and the Indian School of Business
Steven J. Kachelmeier, The University of Texas at Austin
Bin Ke, The Pennsylvania State University
Elizabeth K. Keating, Harvard University
Inder K. Khurana, University of Missouri–Columbia
Ronald R. King, Washington University in St. Louis
April Klein, New York University
Lisa L. Koonce, The University of Texas at Austin
Ranjani Krishnan, Michigan State University
Linda K. Krull, The University of Texas at Austin
Christian Leuz, University of Pennsylvania
Carolyn B. Levine, Carnegie Mellon University
Robert Libby, Cornell University
Robert C. Lipe, University of Oklahoma
Oliver Zhen Li, University of Notre Dame
Laureen A. Maines, Indiana University
Carol A. Marquardt, New York University
Dawn A. Matsumoto, University of Washington
Edward L. Maydew, The University of North Carolina at Chapel Hill
Richard Mendenhall, University of Notre Dame
Michael B. Mikhail, Duke University
Gregory S. Miller, Harvard University
Lillian F. Mills, The University of Texas at Austin
Partha Mohanram, Columbia University
Donald Moser, University of Pittsburgh
James N. Myers, Texas A&M University
Venky Nagar, University of Michigan
Karen K. Nelson, Rice University

Kaye J. Newberry, University of Houston
Doron Nissim, Columbia University
Patricia C. O'Brien, University of Waterloo
Per M. Olsson, Duke University
Mark E. Peecher, University of Illinois at Urbana–Champaign
Kathy R. Petroni, Michigan State University
Morton Pincus, University of California, Irvine
Joseph D. Piotroski, The University of Chicago
Marlene A. Plumlee, University of Utah
Gordon S. Potter, Cornell University
Grace Pownall, Emory University
Suresh Radhakrishnan, The University of Texas at Dallas
Kannan Raghunandan, Florida International University
Shivaram Rajgopal, University of Washington
Scott A. Richardson, University of Pennsylvania
Darren T. Roulstone, The University of Chicago
Rachel Schwartz, University of Illinois at Urbana–Champaign
K. (Shiva) Sivaramakrishnan, University of Houston
Richard G. Sloan, University of Michigan
Geoffrey B. Sprinkle, Indiana University
Phillip C. Stocken, Dartmouth College
K. R. Subramanyam, University of Southern California
Hun-Tong Tan, Nanyang Technology University/Singapore
Robert H. Trezevant, University of Southern California
Mark Trombley, The University of Arizona
Mohan Venkatachalam, Duke University
Joseph P. Weber, Massachusetts Institute of Technology
Richard H. Willis, Tulane University
Peter D. Wysocki, Massachusetts Institute of Technology
Hong Xie, University of Illinois at Urbana–Champaign
Xiao-Jun Zhang, University of California, Berkeley

PAST EDITORS

1926–1929	William A. Paton
1929–1943	Eric L. Kohler
1944–1947	A. C. Littleton
1948–1949	Robert L. Dixon
1950–1959	Frank P. Smith
1960–1962	Robert K. Mautz
1963–1964	Lawrence L. Vance
1965–1967	Wendell Trumbull
1968–1970	Charles H. Griffin
1971–1972	Eldon S. Hendriksen
1973–1975	Thomas F. Keller
1976–1978	Don T. DeCoster
1978–1983	Stephen A. Zeff
1983–1987	Gary L. Sundem
1987–1990	William Kinney
1990–1994	A. Rashad Abdel-khalik
1994–1997	Robert P. Magee
1997–2000	Gerald L. Salamon
2000–2002	Linda Smith Bamber
2002–2005	Terry Shevlin

THE ACCOUNTING REVIEW
Vol. 82, No. 2
2007
pp. 301–326

Required Disclosures in Financial Reports

Katherine Schipper
Duke University

I. INTRODUCTION

This paper considers required disclosures (the portions of audited financial reports that are not recognized) from both a standard-setting perspective and a research perspective. My intent is to describe standard-setting issues (that is, the questions faced by standard setters in establishing disclosure requirements) and research issues (that is, the questions faced by researchers in providing analytical and empirical evidence about required disclosures).[1]

By recognition, I mean depictions in numbers with captions on the face of the financial statements; by required disclosures, I mean display in the notes and supporting schedules that accompany financial statements.[2] Some disclosed items in financial reports are not recognized—and likely never will be—because they cannot be expressed in numbers or, more narrowly, in currency units. Examples include the qualitative description of accounting policies, a summary of inputs to the calculation of a recognized number, and a sensitivity analysis. While I will touch on these types of items, particularly the latter two, my primary focus will be on items that are not recognized but could be.

The amount of financial reporting information that is communicated by means of required disclosures is significant, and has been increasing over time, with no sign of abatement. Despite their abundance, required disclosures are not well understood: we lack a comprehensive theory of *mandatory* disclosures; many questions remain as to how preparers, auditors, and users of financial reports view disclosures, particularly as compared to recognized items; and the Financial Accounting Standards Board (FASB)'s conceptual framework does not provide either a conceptual purpose for disclosures or criteria to support

---

[1] With regard to standard setting, I do not attempt to prescribe how standard setters should determine disclosure requirements. With regard to research, I use examples of published and unpublished research only to illustrate certain research design issues. This paper is not intended to be a review or critique of existing research on disclosures, or on distinctions between recognition and disclosure.

[2] This paper considers only required (mandatory) disclosures; I sometimes use "disclosures" without the modifier "required."

This paper is based on a presentation made at the 2005 American Accounting Association Annual Meeting. I thank Jane Mutchler, 2005 President of the American Accounting Association, for giving me the opportunity to make that presentation, and I thank Mary Barth, Dan Dhaliwal, Joel Demski, Paquita Davis-Friday, Jennifer Francis, Robert Herz, Patrick Hopkins, Lisa Koonce, Richard Lambert, James Leisenring, Thomas Linsmeier, Mark Nelson, Mary Stone, Edward Trott, and Linda Vincent for helpful comments and discussions. This paper was written while I was a member of the Financial Accounting Standards Board. The views expressed are my own and do not represent positions of the Financial Accounting Standards Board. Positions of the Financial Accounting Standards Board are arrived at only after extensive due process and deliberation.

Editor's Note: The Executive Committee of the American Accounting Association has recommended the commission of a series of Presidential Research Lectures, to be delivered at annual meetings of the Association. To encourage broad dissemination, the Committee has requested that *The Accounting Review* publish this lecture given at the 2005 American Accounting Association Annual Meeting.

a sharp distinction between recognized and disclosed items. This last omission is particularly puzzling since standard setters make recognition versus disclosure distinctions in nearly every standard.

I discuss required disclosures in financial reports from several points of view. Beginning with Section II, I consider the purpose of required disclosures—what they are intended to accomplish. Taking this perspective, I explore the dearth of analytical theories of required disclosures, and summarize what can be inferred about disclosure purposes from conceptual guidance, specifically Statement of Financial Accounting Concepts No. 5, *Recognition and Measurement in Financial Statements of Business Enterprises* (SFAC No. 5), and from analyses of disclosure standards. Section III considers how to investigate whether disclosures achieve their intended purposes.

The second portion of my discussion analyzes three differences between disclosed and recognized items. The first is reliability: Are disclosed items less reliable than recognized items (Section IV) and are some disclosed items more reliable than others (Section V)? Section VI considers analytical distinctions developed in theoretical models of differences between disclosed and recognized items. Section VII considers distinctions between recognized and disclosed items that arise based on how information is used. Section VIII offers some concluding comments.

II. WHAT IS THE PURPOSE OF REQUIRED DISCLOSURES IN FINANCIAL REPORTS?

The task of determining the purpose of required disclosures can be approached from at least three directions: analytical modeling; financial reporting concepts; analyses of existing and proposed disclosure requirements. This section uses these three perspectives, and the sources they imply, to discuss the purpose of required disclosures. The section concludes with some inferences about required disclosures, from a standard-setting perspective.

None of the three approaches I take yields crisp inferences about the purpose of required disclosures in financial reports. First, neither analytical models nor financial reporting concepts have succeeded in establishing an agreed-upon objective function for required disclosures. Second, both in analytical modeling and in developing financial reporting concepts, it is difficult to distinguish between recognized and disclosed information. Third, decisions about disclosure requirements made in the development of specific standards are, of necessity, context-specific; in the absence of conceptual and analytical guidance they are also *ad hoc*. However, practical standard-setting considerations require the continued establishment of disclosure requirements; presumably, *ad hoc* disclosure requirements are better than none at all.

Theories of Disclosures

There is no generally accepted theory of *required* disclosures, perhaps because there is no agreed-upon objective function for them. Put another way, it is not that theorists cannot solve the optimization problem, but rather, in the case of disclosure requirements, they cannot agree on what to optimize. Why is this, particularly since theories of *voluntary* disclosure abound?[3]

I speculate that theories of voluntary disclosure are abundant in part because they operate at the level of the individual firm (or manager), where it is possible to posit a reasonably well-specified and defensible objective function. For example, a theory of voluntary disclosure can take as the objective a goal like maximizing firm value or maximizing manager utility. In contrast, *required* disclosures are economy-level policy choices, affecting multiple firms that differ in terms of both economic circumstances and contracting arrangements and parties. In light of this heterogeneity, accounting research has been unwilling (or unable) to posit a social welfare function that should be maximized by the standard setter that establishes requirements for disclosures.

---

[3] For discussions of analytical research in accounting, finance, and economics on (primarily) voluntary disclosures, see, for example, Verrecchia (2001) and Dye (2001).

As discussed in more detail in Section VI, analytical theories also face difficulties in distinguishing between recognized and disclosed items. Theories pertaining to decision-useful information characterize information signals not in terms of their location in financial reports (recognized in financial statements versus disclosed in notes), but rather in terms of their relation to some economic construct of interest, like the terminal value of a firm. The characterizations focus on descriptors such as bias and variance of the signal, or perhaps the covariance of the signal with something else. However, these characterizations *alone* do not separate disclosed from recognized information; it would also be necessary to specify exogenously how disclosed items would differ from recognized items in terms of, say, bias. In addition, this way of characterizing information does not match up with conventional standard-setting approaches to distinguishing between recognized and disclosed information.

Disclosures in the FASB's Conceptual Framework

It might seem that one way forward, with regard to the development of a theory of required disclosures, would be to adopt as the objective the FASB's claim, in Statement of Financial Accounting Concepts No. 1, *Objectives of Financial Reporting by Business Enterprises* (SFAC No. 1), that disclosures, as part of financial reporting, should "provide information that is useful to present and potential investors and creditors and other users in making rational investment, credit and similar decisions" (para. 34). As a basis for a theory of required disclosures, however, I view the objective of providing decision-useful information as insufficiently discriminating, in at least two ways.

First, SFAC No. 1's objective is too general to be helpful in ruling out items from further consideration. For example, the provision of decision-useful information would be consistent with requiring disclosures to reduce information asymmetries between investors and managers (that is, forcing the dissemination of information that management already has), and it would also be consistent with requiring disclosures that mandate the collection and dissemination of *new* information. While significant specificity about decision makers, their decisions, and their objective functions would be needed in order to make an objective of providing decision-useful information analytically tractable, SFAC No. 1 is intentionally silent about both decision makers and their decisions, except to note that those decisions are presumed to involve capital allocation (para. 34).

Second, SFAC No. 1's objective does not help with the distinction between recognition and disclosure. This difficulty applies elsewhere in the conceptual framework as well: recognition is specifically defined in SFAC No. 5 (para. 6), but disclosure is not. In addition to defining and describing recognized items, SFAC No. 5 provides several criteria to be applied to determine financial statement recognition, subject to cost-benefit and materiality considerations. Specifically, SFAC No. 5 notes that recognized items have the best combination of relevance and reliability and that disclosure is not a substitute for recognition (para. 9) and provides recognition criteria (para. 63): the item must meet the definition of a financial statement element; it must have a relevant measurement attribute with sufficient reliability; and the information must be both relevant and reliable.

In contrast to the detailed treatment accorded recognition, SFAC No. 5 merely discusses disclosures (without defining them) and provides some examples. That discussion is not definitive with respect to the question of what disclosures are, conceptually, expected to achieve in the communication of decision-useful information. However, interpreting the discussion in SFAC No. 5 as indicating that recognition is a special case of disclosure, restricted to items that meet certain criteria (that is, disclosures differ from recognized items because disclosed items fail one or more of the recognition criteria) does yield two inferences. First, because recognition is subject to special criteria, and because SFAC No. 5 states that disclosure and recognition are not substitutes, it is evident that disclosure and recognition are not financial reporting alternatives—they are not intended to serve the same purpose. Second, items that meet the definitions of financial statement elements but fail one or more of the recognition criteria should be disclosed, and the most likely criterion to matter for this distinction is reliability. (It seems implausible that a standard setter would not require the recognition of highly reliable items unless those items do not meet the definitions of financial statement elements).

The FASB has declined on at least one occasion (in 1996) to undertake a formal project to develop conceptual guidance on required disclosures, although it has issued several due-process documents on disclosures and disclosure effectiveness.[4] For example, an Invitation to Comment, issued in 1980, noted in very general terms that disclosures must meet decision-usefulness and cost benefit tests. A more detailed discussion can be found in the 1995 *Prospectus on Disclosure Effectiveness*, which was in part a response to a recommendation made by the AICPA Special Committee on Financial Reporting that the FASB seek out and eliminate less effective disclosures.[5]

In 2005 the FASB undertook a major project (joint with the International Accounting Standards Board [IASB]) to revise, update, improve, and converge its conceptual framework with the IASB's *Framework*. That major project is intended to address numerous issues, and disclosure is viewed as far from the most pressing. While acknowledging that "[c]oncepts of display and disclosure clearly need considerable attention ... the Boards have tentatively decided that ... priority should be given to" other matters (Bullen and Crook 2005, 13). The development of disclosure concepts appears (along with presentation and the boundaries of financial reporting) as part of segment E of the project, with no timetable specified (except that work will occur after 2006).

Purposes of Disclosures as Inferred from Standards

A lack of theories and concepts notwithstanding, the FASB has established implicit purposes for disclosures by its decisions in setting standards. In addition, five disclosure purposes are explicitly listed in SFAS No. 105, *Disclosure of Information about Financial Instruments with Off-Balance-Sheet Risk and Financial Instruments with Concentrations of*

---

[4] Other organizations have considered disclosures, but have not arrived at conceptual guidance. For example, the American Institute of Certified Public Accountants (AICPA) discussed disclosure purposes in a 1976 report of the AICPA Committee on Generally Accepted Accounting Principles for Smaller and/or Closely Held Businesses. The report stated that disclosures should provide the following: information to enable understanding of the availability of assets for use in the business; payment requirements of liabilities and legal characteristics of equity; accounting principles used, including changes in those principles; commitments and contingencies; subsequent events; unusual or infrequent events and transactions; related-party transactions. While some of these items are now part of GAAP disclosure requirements, the list does not seem (to me) to suggest a theory or concept of disclosure.

[5] Others, for example, Ray Groves, former managing partner of Ernst & Young, also advised the FASB to reduce the number of required disclosures, stating "Important information is getting lost in a disclosure forest, because our present system does not distinguish between information that's critical for decision making and nonessential data" (Groves 1994). He did not, however, provide criteria to be used in making that distinction.

Credit Risk, issued in 1990 and superseded by SFAS No. 133, *Accounting for Derivative Instruments and Hedging Activities*. Those five disclosure purposes are: (1) *description*: describe recognized and unrecognized items; (2) *measurement*: provide a useful measure of unrecognized items; (3) *alternative measurement*: provide alternative measures of recognized items; (4) *assess risk and reward*: provide information useful for assessing risks and potentials of recognized and unrecognized items; and (5) *interim solution*: use required disclosures to provide information, temporarily, while other solutions are being studied. Examples of disclosure as an interim solution include SFAS No. 36 (disclosure about pensions), SFAS No. 47 (disclosure about long-term obligations), SFAS No. 81 (disclosure about postretirement benefits other than pensions), and SFAS No. 119 (disclosure about derivatives and fair values of financial instruments).[6]

The SFAS No. 105 discussion of disclosure purposes is not inconsistent with the inference, from SFAC No. 5, that disclosure is used to report less reliable information, but the purposes encompassed in SFAS No. 105 are clearly much broader. In addition, research examining specific GAAP disclosure requirements reveals other purposes, not described in SFAS No. 105, and not implicit in SFAC No. 5's discussion of recognition. For example, Barth and Murphy (1994) study all disclosures required by the FASB and predecessor standard setters (except for industry-specific disclosure requirements) through SFAS No. 109, *Accounting for Income Taxes* (promulgated in 1992). They find that some disclosures are apparently intended to aid prediction, citing the example of a required disclosure of a future cash payment.

I illustrate how the purpose of disclosures can be inferred from an analysis of standards by examining SFAS No. 132 and SFAS No. 132R, *Employers' Disclosures about Pensions and Other Postretirement Benefits*. I discuss three (apparent) purposes of disclosure in these two standards: disaggregation to aid in prediction; display of estimates and assumptions to facilitate the assessment of measurement uncertainty; provision of an alternative accounting treatment.

Disaggregation to Aid Prediction

SFAS No. 132/132R requires disclosure about changes in benefit obligations and plan assets, the long-term rate of return assumption for plan assets, a reconciliation of funded status with recognized amounts and components of periodic pension cost. SFAS No. 132R explicitly mentions, as an objective, aiding both assessments of earnings quality and earnings prediction, both of which require *disaggregations*.[7]

It may seem an obvious rule for standard setting that disaggregations should be required to the extent they can improve predictions by grouping items that behave the same way over time and separating items that behave differently. However, similarity of behavior, taken alone, is not a practical guideline for establishing disaggregation standards. For example, the notion of similar over-time behavior (meaning that the items are generated by the same or similar time-series processes) is highly firm-specific, therefore not something that can be put into a standard that applies to all firms. In addition, many plausible behavioral indicators could be used to group items that are similar with respect to that indicator—which ones would be best? It is easy to make the case for grouping by similarity in persistence (which affects valuation multiples, and is not the same as predictability), or by similarity in response to a risk factor such as changes in interest rates, or by similarity in response to a change in activity (fixed versus variable costs).

---

[6] SFAS No. 119, *Disclosure of Derivative Instruments and Fair Value of Financial Instruments* (issued in October 1994) was superseded by Statement No. 133 (issued in June 1998). Within SFAS No. 133, paragraphs 212–213 indicate that SFAS No. 119 was an interim solution and paragraph 216 reiterates the FASB's vision of measuring financial instruments at fair value.

[7] Disaggregation disclosures might also have the objective of displaying information about management's assumptions in measuring assets and liabilities.

Display Estimates and Assumptions to Facilitate Assessments of Measurement Uncertainty

SFAS No. 132/132R requires the disclosure of the sensitivity of the Other Post-Employment Benefits (OPEB) obligation and current period costs to a single input, namely, a 1 percent increase and decrease in the health care cost trend rate. The original reason for this disclosure (per SFAS No. 106, *Employers' Accounting for Postretirement Benefits Other Than Pensions*, para. 355), that health care cost information was unfamiliar to readers of financial statements, has long disappeared, but the disclosure remains. This disclosure can be interpreted as an indicator of the sensitivity of an obligation to changes in economic conditions (the volatility of the OPEB obligation in the face of small changes in one economic determinant of that obligation), or in terms of measurement uncertainty (the effect of a 1 percent error in one of the many estimates used to develop the measurement).

Taking the latter perspective, I have several observations about required disclosures whose purpose appears to be facilitating assessments of measurement uncertainty. First, although such disclosures would seem to be pertinent to *any* significant input to a material measurement, and therefore quite common, they are rare.[8] It is not clear, from the existing examples, what conditions are sufficient to induce a standard setter to require sensitivity disclosures. Second, the kind of sensitivity analysis required by SFAS No. 132/132R may not be as useful as might first appear. If the effects of changing one input are nonlinear (that is, a change of 5 percent does not have five times the effect of a change of 1 percent) or interactive (that is, a change in one input affects other inputs as well), then a sensitivity analysis that considers a small change in just one input has limited value.

Third, if the objective is to convey information about measurement uncertainty, there are other ways to do so. For example, Statement 157, *Fair Value Measurements*, requires disclosures of fair value measurements grouped by categories that are intended to separate items with little measurement uncertainty (because the measures are obtained from observed prices or from applying measurement techniques to observable market inputs) from items presumed to have greater measurement uncertainty (because the measures are obtained from applying measurement techniques to inputs that are not observable from sources external to the reporting entity).[9] Similarly, the standard also requires separate disclosure of items measured at fair value on a recurring basis (e.g., trading securities) versus intermittently (e.g., impaired nonfinancial assets). Certainly, sensitivity analyses supply a different type of information about measurement uncertainty than do disclosures that group fair value measurements by the nature of the inputs to those measurements. In addition, the costs to prepare the two types of information would also be expected to differ. A standard setter choosing disclosures to describe measurement uncertainty must currently do so without much conceptual guidance or empirical evidence, implying that the decision may be driven by *ad hoc* considerations and a highly subjective cost-benefit analysis.

---

[8] But these types of disclosures are not unknown. For example, SFAS No. 140 (para. 17(g)(3)) requires, for key assumptions, the disclosure of the hypothetical effect on fair value of retained interests in securitized financial assets of two or more unfavorable variations from the expected levels.

[9] The final standard was issued in September, 2006.

Provide an Alternative Accounting Treatment

SFAS No. 132/132R requires disclosure of changes in defined benefit pension obligations and plan assets, including unrecognized gains and losses. The decision *not* to require recognition of these amounts was not based on concepts. The basis for conclusions of SFAS No. 87, *Employers' Accounting for Pensions* (paras. 102 and 104) states that a preferable accounting treatment would recognize the net pension asset or liability measured as the difference between plan assets and the projected benefit obligation, with immediate recognition of changes in that net asset or liability. The FASB acknowledged that delayed recognition excludes the most current and relevant information, thereby conflicting (in my view) with SFAC No. 5's concept that the most relevant and reliable information should be recognized. However, the FASB also concluded (para. 107) that recognition of both a net pension asset or liability (equal to the difference between plan assets and the projected benefit obligation) and changes in that net asset or liability as they occur would be "too great a change from past practice to be adopted at this time."

Defined benefit pension arrangements are not the only instance when the FASB required disclosure but not recognition of a conceptually preferable treatment (other examples include SFAS No. 123, *Accounting for Stock-Based Compensation*). The implication is that disclosure is sometimes intended to compensate for recognition and/or measurement that requires (or permits) a less preferred accounting treatment. This implication raises two related questions.

First, why do standard setters *knowingly* require or permit less preferred recognition treatments, sometimes but not always compensating by requiring disclosures? The answer to this question must lie outside the conceptual framework, which states that disclosure is not a substitute for recognition. There is, therefore, ample scope for explanations based on factors unrelated to the FASB's conceptual framework, including political pressures and lobbying from constituents, and several accounting research papers have probed such explanations. However, those explanations do not seem to describe the FASB's standard-setting decision processes *generally*; what, then, are the special characteristics of standard-setting situations that result in requiring disclosure but not recognition of a conceptually preferred treatment?[10]

Second, what are the consequences of those decisions? For example, are the compensating disclosures effective, in the sense of causing information about the arrangement described in the disclosures to be reflected in investor and creditor judgments and decisions? Are there other consequences, either real effects or financial reporting effects, associated with the decisions? As discussed in more detail in later sections, such effects could arise from differences in the preparation, auditing, or use by investors and others of disclosed information as opposed to recognized information.

Inferences about Required Disclosures from a Standard-Setting Perspective

Perhaps surprisingly, given its purpose of guiding standard-setting decisions, there is but sparse discussion of disclosures in the FASB's conceptual framework. Furthermore, the clearest conceptual message—that disclosures should present relevant but less reliably measured items—does not seem to capture the purpose of some existing disclosure requirements. SFAS No. 105, now superseded, seems to come closest to conceptual guidance, but it provides a list without much discussion, and that list also appears to be incomplete. Specifically, analysis of disclosure requirements in existing standards suggests that disclosures may be used to alleviate noncomparability, present inputs into the measurement of recognized items, and present accounting alternatives when recognition and measurement standards permit or require a less-than-preferred treatment.

---

[10] Interpreted broadly, this question applies more generally to situations in which a standard setter rejects a conceptually preferred treatment. Although a comprehensive treatment of this question lies beyond the scope of this discussion, I speculate that insights might be gained from a careful analysis of the basis for conclusions in standards that reject explicitly a conceptually preferred treatment. For example, as previously noted, SFAS No. 87 refers to practical considerations to justify disclosing (rather than recognizing) the funded status of defined benefit pension arrangements.

In the absence of conceptual guidance, two interrelated types of pragmatic considerations appear to determine standard-setting decisions about required disclosures. First, standard setters appear to consider disclosure requirements *after* recognition and measurement decisions have been made, and in the context of those decisions. Second, standard setters appear to make explicit and implicit assumptions about judgments and decisions financial statement users are likely to want to make, again, in the context of the standard.[11] That is, the standard setter appears to identify a judgment or decision that could not be made (or could not be made effectively) using recognized items only and then to analyze existing disclosures to determine if they are adequate for that judgment or decision. If not, then the standard setter would require disclosures that are adequate.[12] As a result, disclosure requirements are specific to the recognition and measurement requirements for the events and transactions that are in the scope of the standard, and to standard setters' beliefs about what judgments and estimations users want to make. Given the number and variety of events and transactions that are subject to recognition and measurement guidance, as well as the number and variety of financial statement users' judgments and decisions, this pragmatic approach does not seem to place meaningful limits on the growth of disclosure requirements.

Finally, the fact that inputs into the measurement of recognized items are sometimes required to be disclosed suggests a possible standard-setting tension between communicating a conceptually grounded *measurement* of a financial statement item by requiring recognition and specifying a measurement attribute, and communicating *information* that can be used to create measurements. For example, a financial reporting standard that required separate recognition and measurement of the components of compound instruments such as convertible debt would communicate a conceptually grounded measurement.[13] Alternatively, the standard might retain the current accounting treatment of convertible debt (i.e., no separation into components) while requiring detailed disclosures intended to provide information that would support inferences—including measurement inferences—about those components.

---

[11] One recent example is the FASB's Exposure Draft (joint with the IASB), *Business Combinations, A Replacement of SFAS 141,* which states disclosure objectives that are specific to its recognition and measurement proposals. For example, disclosures should enable users of financial statements to evaluate (1) the nature and financial effect of business combinations; (2) financial effects of adjustments to accounts made in the current period because of business combinations in the current or previous period (examples include changes in contingent items and deferred tax assets); (3) changes in the carrying amount of goodwill. Clearly, these objectives are specific to business combinations, are based on assumptions about the judgments and decisions financial statement users want to make, and are not derived from a discernible *general* disclosure principle.

[12] Accounting research can provide evidence to aid this determination. For example, the disclosures in SFAS No. 107 and SFAS No. 119 were shown to be not sufficient for determining risk exposures to interest rates, foreign currency fluctuations, and commodity prices (Wong 2000). However, subsequent FRR No. 48 disclosures required by the SEC are apparently workable for this purpose (Thornton and Welker 2004; Linsmeier et al. 2002). But they are not, apparently, sufficient. Sribunnak and Wong (2006) show that the permitted exclusion of nonfinancial items from the scope of required sensitivity-analysis disclosures (on cost-benefit grounds) impedes the usefulness of FRR No. 48 information for analyzing exchange rate exposure. That is, disclosures that exclude nonfinancial items will reflect only financial instrument positions and will not reflect overall risk exposure. Interestingly, a substantial minority of Sribunnak and Wong's (2006) sample firms voluntarily provided a sensitivity analysis at the firm level (i.e., they included nonfinancial items).

III. DO DISCLOSURES ACHIEVE THEIR INTENDED PURPOSES?

This section considers the structure of investigations into the effects of required disclosures. The lack of both theory and conceptual guidance for determining the purpose of required disclosures means that both the establishment of disclosure requirements and research on the effects of required disclosures proceed on a case-by-case basis. That is, research whose objective is to provide evidence on whether disclosures have the intended effects (or unintended effects, or no effects at all) tends to proceed along lines that are similar to the pragmatic and *ad hoc* standard-setting approach to establishing disclosure requirements described in the previous section. For example, research usually considers one context-specific disclosure purpose at a time, sometimes inferring the intended purpose from an examination of the disclosure requirement itself.

Following identification of a disclosure purpose, the next step in the research design is to identify one or more context-specific outcome indicators whose properties will change in some predictable way if the disclosure is effective. That identification might be based on an analysis of the standard's stated purpose, or on an analysis of the expected informational properties of the disclosed information.

An example of research that focuses on the standard's stated purpose is Street et al. (2000), who analyze the benefits expected from the application of SFAS No. 131, *Reporting Disaggregated Information about a Business Enterprise*, as stated in the "Basis for Conclusions" of that standard. The expected benefits include reporting more segments, reporting more information about each reportable segment, and consistency between segment information and other parts of financial reports. Street et al. (2000) used direct inspection of the financial reports of large public companies to determine if each of these objectives was met (e.g., after SFAS No. 131 became effective, are more segments, and more information about each segment, reported; are the segment disclosures consistent with, for example, the Management Discussion and Analysis).

Alternatively, researchers might choose outcome indicators that are implied by the nature of the disclosure, as opposed to explicitly stated in the standard, with emphasis on informational properties. For example, research has identified *increased predictive ability* as one intended purpose of disclosures. The outcome indicator in this context is better (more accurate, less biased) predictions of some recognized or disclosed item. In a disaggregation context, Cole and Jones (2004) show that disaggregating revenues to identify same-store sales increases the ability to predict both revenues and earnings. In a risk analysis context, Jorion (2002) shows that value-at-risk disclosures predict variability of bank trading revenues, an outcome indicator of better information about risk profiles of trading portfolios. Finally, numerous analyses show that segment disclosures improve the performance of both statistical models and analysts in predicting earnings.

Another purpose of disclosures posited by research is to provide sufficient information to *undo noncomparable accounting* or *create an alternative treatment*. Research that considers this purpose focuses on standards that create explicit treatment alternatives (e.g., both

---

[13] Some compound instruments that contain embedded derivatives are separated into components for accounting purposes, per the requirements of SFAS No. 133 (paras. 12–16).

LIFO and FIFO inventory cost flow assumptions are permitted) or that are alleged to treat economically similar arrangements differently (e.g., operating versus capital leases; sale versus secured borrowing treatment for financial asset securitizations; disclosures about nonhomogeneous unconsolidated subsidiaries versus consolidation prior to SFAS No. 94, *Consolidation of All Majority-Owned Subsidiaries*).

Sometimes in this strand of research, effective disclosures are a necessary component of the research design; that is, answering the research question assumes or requires that disclosures be effective. For example, research on the use of LIFO inventory accounting may use LIFO reserve disclosures along with other information to place LIFO and FIFO firms on the same accounting basis; that is, the research design requires that the disclosed LIFO reserve be effective for undoing the noncomparable accounting that results from an explicitly permitted treatment alternative (e.g., Dopuch and Pincus 1988).

In other cases, disclosures are used to identify and adjust for financial reporting that allegedly permits (or requires) similar arrangements to be accounted for differently. For example, Imhoff et al.'s (1991, 1993) use of required disclosures about operating lease payments to approximate the effects of treating those leases as capital leases assumes that operating lease disclosures provide enough information to capitalize operating leases. With regard to nonhomogeneous unconsolidated subsidiaries, Wiedman and Wier (1999) show that disclosures of assets, liabilities, and operating results required by Accounting Research Bulletin No. 51, *Consolidated Financial Statements* (para. 51), could be used to compute as-if-consolidated leverage ratios. Finally, with regard to financial asset securitizations, Niu and Richardson (2006) use disclosed information to calculate credit enhancements to transferred receivables as an indicator of whether financial asset securitizations are substantively more like sales or more like secured borrowings.

A third purpose for required disclosures posited by research is to *reduce uncertainty*. For example, Linsmeier et al. (2002) show that FRR No. 48 risk disclosures reduce uncertainty/diversity of opinion about the implications for equity values of changes in certain market interest rates, foreign exchange rates, and commodity prices. In this context, the outcome indicator is less uncertainty and less diversity of opinion.

Taking a different approach to analyzing the effects of required disclosures, some research asks whether disclosure requirements have real effects on organizational structures or business arrangements. For example, Street et al. (2000) investigate the speculation that SFAS No. 131's requirement to define segments in terms of organizational structures induced changes in those structures (for example, a manager could be directed to report to someone other than the decision maker indicated in SFAS No. 131, thereby avoiding the need to disclose results for that manager's unit). As an example of changes in commercial arrangements because of disclosure requirements, Imhoff and Thomas (1988) document rearrangements of lease terms because of SFAS No. 13, so that more leases would qualify for disclosure-only operating lease treatment.[14]

To summarize, research on the effects of required disclosures tends to proceed in the same context-specific, case-by-case manner as does standard setting for disclosure requirements. Typically, the researcher posits an outcome indicator that is expected to change if the disclosure being examined has the intended effect, or, alternatively, the researcher uses a required disclosure to adjust recognized numbers in a specific research context. Finally, some research considers, on a case-by-case basis, whether disclosure requirements might affect organizational structures or business arrangements.

---

[14] Transaction structuring is widely believed to occur in response to accounting standards that offer a treatment that is perceived as favorable for certain qualifying arrangements; in the case of SFAS No. 13, the favorable treatment accorded to operating leases takes the form of off-balance-sheet financing, with disclosure of certain aspects of the obligations. Another example of transaction structuring—but not in response to disclosure requirements—is provided by Lys and Vincent (1995), who describe how AT&T structured its acquisition of NCR to qualify for pooling-of-interests treatment.

IV. ARE DISCLOSED ITEMS LESS RELIABLE THAN RECOGNIZED ITEMS?

While research on the relative reliability of disclosed versus recognized items may appear to presume general agreement on what is meant by "reliability," I believe that there is no such agreement, with regard to either the construct itself or its measurement.[15] Some appear to believe that reliability is the ability of information to be vouched to, or confirmed by, an external archival source. Others appear to believe that reliability means the item's measurement is characterized by a high degree of consensus among independent measurers (a notion that subsumes the first idea of reliability). Still others appear to believe that reliability refers to precision of measurement (which is related to but differs from the consensus-of-measurers notion of reliability).

I do not attempt to resolve these differences, nor do I attempt to describe an empirical measure that captures either absolute or relative reliability (although I believe such a measure would be extremely valuable). Instead, in this section, I ignore the effects of differences in how preparers, auditors, users, and researchers might define and measure relative and absolute reliability, and describe evidence from accounting research and from other sources on the reliability of disclosures, in particular, the *relative reliability* of disclosed items, as compared to recognized items. Each subsection of this discussion is organized by type of evidence (archival versus experimental) and by perspective (management, investor, and auditor).

Archival Research That Considers Management's Perspective on Reliability of Disclosed Items

Managers might express their views about the reliability of disclosed items in at least three ways: direct discussions; choosing recognition (disclosure) for more (less) reliable items, when that choice is offered; and taking less care in preparing disclosed items. With regard to direct discussions, explicit management characterizations of the reliability of required disclosures are rare. However, Frederickson et al. (2006) report that some pro forma disclosures of fair values of share based payments per SFAS No. 123 were accompanied by a management disavowal of the reliability of the disclosed numbers.[16]

With regard to disclosing instead of recognizing less reliable items, *true* choices between recognition and disclosure—a precondition for managers to be able to select disclosure for less reliable items—are also rare. However, presuming that suitable settings can be found, the research question is: Given a choice between recognition and disclosure, does management recognize more reliably measured items?

---

[15] Public discussions between the FASB and its constituents, as well as comment letters received from constituents, make this clear. In fact, confusion and disagreement about the meaning of "reliability" caused this issue to be considered early in the joint IASB-FASB conceptual framework project. (This item is listed as the second "cross-cutting issue" under qualitative characteristics in Bullen and Crook's [2005] description of the joint conceptual framework project). The joint IASB-FASB Preliminary Views document, *Conceptual Framework for Financial Reporting: Objective of Financial Reporting and Qualitative Characteristics of Decision-Useful Financial Reporting Information* (issued July 6, 2006), proposes replacing "reliability" with "representational faithfulness" as a qualitative characteristic of accounting information, explaining (paras. BC2.26–2.28) that this change is intended to eliminate disagreements and confusion that arise because there is not a shared meaning of "reliability."

[16] Frederickson et al. (2006) also report that, in an experimental setting, if the disavowals are sufficiently transparent (specifically, a side-by-side comparison of a disavowing firm with one that does not disavow), users of those financial reports (in their experiment, business school alumni) attend to those disavowals in making judgments about reliability.

In a study that does not purport to capture a setting of free choice between recognition and disclosure, Cotter and Zimmer (2003) report that managers choose recognition for asset revaluations that are deemed more reliable and recognition for those deemed less reliable. The context is real estate asset revaluations, whose periodic disclosure is required by Australian accounting standards. In addition, Australian Concepts Statement 4 permits assets to be recognized (as opposed to disclosed) only when they can be measured reliably. Therefore, the setting is one in which managers are *required* to disclose, not recognize, items that they judge to be less reliable. Note that the research design requires an *ex ante* specification of reliability; Cotter and Zimmer (2003) use the nature of the asset (land versus buildings) to make this specification.

Archival research on whether management chooses disclosure for less reliable items is also confounded by self-selection that is predicated on incentives and other factors that are not obviously and directly related to reliability *per se* but that could have complex associations with reliability. For example, Aboody et al. (2004) find that firm size as well as several incentive-related factors appear to influence voluntary choices to recognize (rather than disclose) the fair value of share-based payments to employees, including capital market participation, CEO and board ownership of shares, and bonus arrangements that are relatively less sensitive to earnings. Research that aims to document associations between disclosure versus recognition choices and firm characteristics (including management's incentives) does not address the possible existence of links between reliability factors and other factors that determine the selection of recognition versus disclosure, in the few instances where these are true alternatives. In addition, while accounting research has attempted to deal with self-selection bias in accounting choices, Larcker and Rusticus (2005) raise questions about the efficacy of certain commonly used approaches.

Finally, evidence on whether preparers take less care about disclosures, relative to recognized items, tends to be either anecdotal or circumstantial. For example, Wiedman and Wier (1999) report that recognized numbers reported pursuant to the retrospective application of SFAS No. 94 were not always consistent with previously disclosed amounts. For 22 sample firms, the difference between as-if consolidated debt (based on constructive capitalization of disclosed debt of nonhomogeneous unconsolidated subsidiaries) and (restated) consolidated debt was at least 5 percent of equity. In addition, 38 sample firms that provided no disclosures about nonhomogeneous unconsolidated subsidiaries revealed an average of $252 million of subsidiary debt in SFAS No. 94 restatements.

It is management that prepares reported and disclosed items, so presumably they are in the best position both to know about and influence reliability differences. Difficulties of research setting, research design, data availability, and controlling for self-selection bias notwithstanding, therefore, even indirect evidence on management's perspective on the relative reliability of disclosed items would be valuable.

Archival Research That Considers Investor Perspectives on Reliability of Disclosed Items

Within this strand of research, there are two broad approaches. The first is direct estimations of investor perceptions of measurement errors. Research using this approach relies on techniques used by, for example, Barth (1991), Choi et al. (1997), and Davis-Friday et al. (2004). The approach applies conventional econometric techniques to equity valuation models (that is, models of market value of equity as a function of accounting assets and liabilities) to extract an estimate of investors' perception of the measurement error in the accounting numbers from estimates of capitalization coefficients (that is, valuation multiples applied to accounting numbers). This approach relies on the presumption that, absent measurement error in the accounting numbers, capitalization coefficients on assets and liabilities would be equal to 1 (in magnitude), with opposite signs.

The second approach is also based on investor perceptions, as captured by associations between market variables (summary indicators of investor judgments and investment decisions) and both recognized and disclosed items. This approach involves regressing a market variable (e.g., stock prices or returns) on disclosed and recognized items. Small valuation weights (estimated regression coefficients) on the disclosed items are taken as evidence that investors perceive disclosed items to be less reliable than recognized items. Association tests can use two basic within-firm research designs that are intended to hold constant both firm-specific (i.e., managerial perspective) effects and relevance effects by considering disclosure versus recognition of the same (or similar) items by the same firms. Unfortunately (for accounting researchers), settings that meet these two characteristics are not common.

The first within-firm design uses the firm as its own control in an over-time analysis in which periods of disclosure are followed by periods of recognition, usually because of a change in reporting requirements. That is, disclosure of an item (e.g., derivatives, OPEB obligations) is followed by required recognition of that same item. The research design compares the valuation weights (estimated regression coefficients) obtained by separate regressions of market variables on the items when they are disclosed and when they are recognized. For example, Davis-Friday et al. (1999) report lower valuation weights on OPEB items disclosed pursuant to SEC Staff Accounting Bulletin (SAB) No. 74 than for those same items subsequently recognized upon adoption of SFAS No. 106. This research design uses SAB No. 74 required disclosures of the effects of standards that have been issued but not adopted as of a reporting date.[17] In a different context, for a sample of banks, Ahmed et al. (2006) report that valuation coefficients on disclosed derivatives (prior to SFAS No. 133, with disclosures required by SFAS No. 107 and SFAS No. 119) are not significant, but valuation coefficients on derivatives recognized pursuant to SFAS No. 133 are significantly positive.

The second within-firm research design uses the same firm, at a single reporting date, that applies both disclosure and recognition for the same (or similar) items. Applying this design to a sample of banks, Ahmed et al. (2006) exploit the fact that prior to SFAS No. 133, derivatives in certain arrangements were recognized, while derivatives in other arrangements were disclosed. They report that investors placed lower valuation weights on the disclosed derivative amounts. Interestingly, they do not attribute these lower valuations to decreased reliability, pointing to the use of observable market inputs to measure the derivatives at fair value.

Regardless of the approach taken, drawing inferences about the reliability of disclosed items from archival analyses of investor perceptions requires certain assumptions. For example, investors are assumed to process recognized and disclosed items in the same way, so that any differences in valuation weights, and any estimates of measurement error, can be attributed to informational qualities of the items and not to cognitive activities of investors. As another example, drawing broad inferences about differences in reliability between disclosed and recognized items by analyzing several research papers, each of which studies a distinct disclosure, requires assumptions about whether different kinds of disclosures differ in reliability. Both of these assumptions are discussed in more detail in later sections.

---

[17] I discuss possible confounding influences on SAB No. 74 disclosures in Section V.

In addition, archival research that attempts to identify investor perceptions of reliability can be difficult to interpret, for several reasons. First, valuation weights (i.e., estimated coefficients from regressions of market variables on disclosed and recognized items) often differ significantly from their theoretical values for *both* recognized and disclosed items; the researcher typically resorts to comparing the estimates to zero or each other, not to their theoretical values, and inferring less reliability from a lower valuation weight or one that is not reliably different from zero. Second, reasonable confidence intervals around the estimated valuation weights on disclosed items can encompass both zero and the coefficients on recognized items; in those cases it is difficult to determine whether investors perceive the disclosed items as useless for valuation (a zero weight) or about as useful as recognized items (a valuation weight similar to the weight on recognized items). Third, results are sometimes sensitive to specification choices. For example, Boone (2002) revisits results that indicate low value relevance for disclosures required by SFAS No. 69, *Disclosures about Oil and Gas Producing Activities, an Amendment of FASB Statements 19, 25, 33, and 39.* Previous research had concluded that those disclosed values are fraught with measurement error because reserves are difficult to estimate and SFAS No. 69 imposes questionable assumptions as measurement inputs (e.g., a required 10 percent discount rate). However, Boone (2002) finds that previous results are due in part (perhaps in large part) to model misspecification.

Experimental Research That Considers Auditor Behavior with Respect to the Reliability of Disclosed Items

One possible source of lower reliability of disclosed versus recognized items is differences in auditor behavior.[18] For example, Libby et al. (2006) conclude that auditors are likely to permit more misstatement in a disclosed item (fair value of share-based payments) than in a recognized item (balance sheet amount for a capital lease), and that the difference is due at least in part to an auditor perception that errors in disclosed amounts are less material. There are at least three possible reasons for such a difference in behavior: differences in auditing standards; differences in materiality judgments; and differences in auditing practices.

With regard to the first possibility, auditing standards that require or permit auditors to distinguish between recognized and disclosed items could cause differences in reliability between the two types of items. However, my reading of AU Section 9312A, *Audit Risk and Materiality in Conducting an Audit,* combined with extensive discussions with auditors, suggests that auditing standards *do not* distinguish between recognized and disclosed items.[19]

Second, auditors applying SEC Staff Accounting Bulletin (SAB) No. 99 might reach different materiality judgments about recognized versus disclosed items. SAB No. 99 does not formally and explicitly distinguish between recognized and disclosed items. Its basic principle defines materiality in terms of what would affect the judgment of a reasonable person (that is, a financial statement user). If auditors believe that judgments of users are intrinsically less sensitive to disclosures—because of characteristics of those users and not because of characteristics of the items themselves—then they may reach different materiality judgments for disclosed versus recognized items.[20] The preceding statement is, of course, pure speculation, because we simply do not know much about auditor assumptions about financial statement users, and user assumptions about auditors. This is a potentially important issue—a destructive circle of decreasing reliability of required disclosures could arise if users rely less on disclosures because they believe disclosures are prepared and audited less rigorously, and preparers/auditors apply less rigor in preparing disclosures because they believe users rely less on them.

---

[18] From the auditor's perspective, management has already developed the item to be disclosed (and thereby affected its properties, including reliability). Libby et al. (2006) do not consider that step in the financial reporting process.

[19] See, in particular, paragraph 1.02, which describes misstatements as explicitly including disclosures that are not presented in accordance with GAAP. That said, special rules apply to segments (AU Section 9326), related parties (AU Section 334) and required supplementary information (SFAS No. 69 is one example).

Although SAB No. 99 does not distinguish formally and explicitly between the materiality of recognized versus disclosed items, it may contain an implicit distinction, on two grounds. First, three of its 13 materiality criteria could not be applied to disclosures because they pertain explicitly to recognized items.[21] Second, SAB No. 99's distinction between items that are capable of precise measurement and items that are "estimates" is similar to the SFAC No. 5 notion that disclosures are for items that are measured with less reliability.

With regard to the third possibility, even if auditing *standards* (including SAB No. 99) do not distinguish recognized items from disclosed items, auditing *practices* may do so. If that is the explanation, are the differences due to incentives, or to something else? Research cited by Libby et al. (2006) suggests incentive effects: auditors are more likely to waive audit adjustments when they perceive lower litigation risk, or when factors associated with the item suggest lower litigation risk (e.g., smaller amounts, items that decrease income, items that are harder to verify), or when the client resists. This suggestion raises two questions. First, if incentive effects arise from auditor *perceptions* about litigation risk, then is the *actual* association with litigation risk the same, or different, for disclosed versus recognized items? Second, if incentive effects arise from client (preparer) resistance, then to what extent do preparers care less about audit adjustments to disclosed than to recognized numbers—and why?

If auditors do, in fact, apply different (less stringent) reliability thresholds to disclosed versus recognized items, then evidence about the causes and consequences of these differences would be of significant interest. Specifically, evidence that disclosed items are less reliable not because of intrinsic measurement difficulties (a key conceptual reason for requiring disclosure instead of recognition) but rather because of the way disclosure standards are implemented should affect the FASB's decisions about disclosure requirements.

Can Archival Research Directly Estimate Reliability?

Most of the research assessing reliability provides inferences based on archival or experimental evidence of perceptions of investors or auditors. However, it would seem that an approach that does not rely on the perceptions of participants in the financial reporting process would be desirable. Such an approach would involve the direct estimation of either absolute reliability or relative (to recognized items) reliability of items that are required to be disclosed in financial reports. Estimation would be required because the actual reliability of a reported number would be observable (at best) to preparers and possibly auditors, and it is not clear that the results of observation (if it could be done) would lend themselves to the types of quantifications that would be required for systematic analysis. In addition, it would seem that direct estimation of reliability would require a benchmark or a standard against which to measure the (un)reliability of the amount actually disclosed, and virtually any *observable* standard or benchmark might itself be subject to some degree of reliability concerns.

---

[20] A later section discusses the question of differential user sensitivity to disclosed versus recognized information.

[21] Those three criteria are: the item masks a change in earnings or other trends; the item masks a failure to meet analysts' forecasts; the item changes a loss to income or vice versa.

Those difficulties notwithstanding, it may be possible to reconfigure, extend, and reinterpret certain estimation methods that have been used in the earnings management and reporting quality literatures, and deploy them to investigate reliability. Typically, in research on earnings management, the objective is to extract a nondiscretionary (or normal) component of a financial statement number (e.g., total accruals, current accruals) by regressing that number on accounting fundamentals (e.g., revenues, fixed assets, cash flows). The remainder of the financial statement number—the part that is not statistically associated with accounting fundamentals—is viewed as discretionary (or abnormal) (e.g., Jones 1991; Dechow and Dichev 2002). One key modification to this approach that would be needed to estimate reliability is obtaining fundamentals that represent a benchmark or standard for reliability.

Taking a step in this direction, Beaver and Venkatachalam (2003) use the regression-on-fundamentals approach to extract a nondiscretionary component (representing information content), a discretionary component (representing either managerial signaling or manipulation) and a "noise" component (the regression residual) from disclosed fair values of bank loans. These extraction approaches require strong assumptions (a number of which have been challenged) and some difficult choices, in terms of accounting fundamentals. For example, for the extraction process to provide meaningful evidence on reliability, it must be assumed (or, preferably, demonstrated analytically) that a reliable number *would have* a specific statistical relation to the accounting fundamentals, so that the portion of the number that is not captured by the statistical relation is, by definition, unreliable. In this regard, Wahlen's (2003) discussion of Beaver and Venkatachalam (2003) points out a number of difficulties in specification, estimation, and interpretation, and offers constructive suggestions for dealing with some of them.

Despite those concerns, and the many difficulties with extraction approaches over the 15 or so years they have been used (e.g., in investigations of earnings management), the possibility remains that the approaches might be further developed to provide evidence on reliability. In particular, reliability assessments can be made (and from a standard-setting perspective, should be made) one number at a time (e.g., disclosed fair values of loans; gains on transfers of financial assets accounted for as sales) so specifying the relation between fundamentals and the reliable portion of the number, based on the researcher's knowledge of both accounting and the economic determinants of reported outcomes, may be feasible.[22]

V. DOES RELIABILITY DIFFER ACROSS TYPES OF DISCLOSURES?

This section returns to the possibility, mentioned in Section IV, that within the class of items that are disclosed (instead of recognized) there are discernible differences in reliability. I discuss three possible sources of differences: whether the disclosure requirement is temporary; whether the disclosure disaggregates a recognized number; and whether the disclosure requires the application of an accounting treatment or measurement attribute that is specific to that disclosure (i.e., the accounting treatment or measurement attribute used for the disclosed item is not associated with a recognized item).

---

[22] The nature of standard setting necessitates an item-by-item reliability analysis. In contrast, accounting research considers both individual items (e.g., the components of net pension cost) and aggregated numbers (e.g., net income, total accruals). The reliability of an aggregated number, such as net income, is likely to be a complicated function of the separate reliability of each of its components.

Temporary versus (Near) Permanent Disclosure

Some disclosures have been required for several (or many) years, with no immediate expectation of either recognition of the disclosed amounts or a change in disclosure requirements. Examples include the requirement that LIFO users disclose unrealized inventory holding gains (LIFO reserves) and the requirement in SFAS No. 107 to disclose fair values of certain financial instruments. One plausible assumption about these recurring disclosures is that preparers have developed expertise in the required measurements, and the recurring nature of the disclosures is itself a disciplining mechanism. In contrast, SAB No. 74 requires *nonrecurring* disclosures of estimated impacts of adopting new standards, before those standards are adopted. Its requirements are quite general and many disclosures under those requirements are qualitative.[23] In thinking about SAB No. 74's nonrecurring disclosures, the issue is whether the requirement to disclose the "impact" of a new standard is tantamount to a requirement to disclose something that will, very soon, be recognized, and whether, so early in the adoption process, the reliability of measurement would be lower than when adoption is complete.

The question of nonrecurring SAB No. 74 disclosures is of interest to accounting researchers to the extent that SAB No. 74 disclosures are idiosyncratically less reliable. If they are, then research that assesses disclosure versus recognition using an over-time, within-firm design comparing SAB No. 74 pre-adoption disclosed amounts with post-adoption recognized amounts faces a confounding effect so that tests based on those disclosures might *understate* the reliability of disclosures in general. In this regard, Davis-Friday et al. (1999) note that SAB No. 74 disclosures of the impact of SFAS No. 106 were in some cases ranges, not point estimates, and disclosures of ranges appear to have lower valuation weights than point estimates. My own discussions with practicing professional auditors suggest that SAB No. 74 disclosures are often vague, and state that the impact of adopting a new standard has not been determined.

Disaggregated Disclosures of Recognized Amounts versus Disaggregated Disclosures That Are Based on Measurements and Allocations That Differ from Those in Recognized Amounts

In principle, a disclosure that simply disaggregates a recognized amount by listing the items that were aggregated to arrive at the recognized number requires no new calculations (no new information systems, data, or measurement techniques) and would, therefore, impose no incremental costs to prepare or audit. The inference is that the disaggregating disclosure should have the same reliability as the aggregated recognized amount. If this inference is correct, then any differences in how investors appear to treat the recognized versus disaggregated disclosed amounts cannot be attributed to differences in reliability. Instead, differences would have to be due to some combination of differences in the properties of the numbers themselves (e.g., the valuation properties of the aggregated recognized amount differ from the valuation properties of the components of that amount) and differences in the way investors use disclosed versus recognized items.

In contrast, a disaggregated presentation that is based on measurement or allocation principles that differ from the principles applied to develop the recognized amount imposes potentially significant preparation and auditing costs, whose nature and magnitude would vary with the nature of the disaggregated presentation. For example, the reconciliation of

---

[23] SAB No. 74 requires the preparer to discuss the impact that a standard is expected to have on the financial statements of SEC registrants, unless that impact is not known or reasonably estimable. In that case, a statement to that effect may be made.

defined benefit plan assets and obligations probably imposes few incremental costs while the presentation of revenues, assets, and operating income by segment requires an entire system of allocations.

Assuming that certain disclosures are more costly to prepare, because they require much more than listing the components of an aggregated recognized number, under what circumstances might that cost difference affect the reliability of the disclosures? Would preparers adopt shortcuts and practical expedients to reduce cost, even if those actions systematically reduce reliability? I believe that this issue would be most acute when an entire pro forma presentation using a measurement attribute or accounting treatment other than the one required (or permitted) for recognition is required to be disclosed, and the information is not prepared and used for any other purpose.

Disclosures That Present an Alternative Measurement Attribute

SFAS No. 105 states that one objective of disclosure is the presentation of an alternative relevant measurement attribute (for example, disclosure of fair value for certain financial instruments that are recognized at amortized cost). That objective would apply when GAAP specifies a required measurement attribute for recognized items, for example, cost with impairments for bank loans, but the FASB believes that an alternative measurement (also) provides relevant information. This way of using disclosures is (at least on the surface) consistent with the idea, in the FASB's conceptual framework, that disclosure would be the preferred presentation for information that is viewed as relevant but not sufficiently reliable for recognition purposes, under the presumption that the disclosed fair values suffer from reliability concerns.

There is, however, another objective of required disclosures of alternative measurement attributes that is not specified in SFAS No. 105 and is not, in my view, consistent with the FASB's conceptual framework. That objective is to mitigate the effects of noncomparability when GAAP permits a free choice between two different measurement approaches. This type of required disclosure appears in SFAS No. 156, *Accounting for Servicing of Financial Assets—An Amendment of FASB Statement No. 140* (March 2006), which permits a free choice between fair value and a different measurement attribute for servicing rights.[24]

The use of disclosures to present alternative measurement attributes raises at least three questions. First, with regard to the properties of the disclosed measurement, does it matter whether the recognized measurement is a free choice, as in SFAS No. 156, or specified by GAAP, as in case of many financial instruments? Second, research on accounting choice (e.g., the choice between LIFO and FIFO) suggests that firm-specific attributes are highly correlated with (and perhaps even cause) accounting choices. Will this finding generalize to the fair value treatment choices recently promulgated (and also being considered) by the FASB and if so, are there implications for the disclosed measurements? Third, treatment alternatives in the form of free choice between two measurement attributes create noncomparabilities; required disclosures are intended to mitigate that effect. To what extent are those disclosures successful?

---

[24] Free choice between fair value and another measurement approach is also permitted in SFAS No. 155, *Accounting for Certain Hybrid Financial Instruments—An Amendment of FASB Statements No. 133 and 140* (February 2006) and FASB Staff Position FTB 85-4-1, *Accounting for Life Settlement Contracts by Third Party Investors* (March 2006).

VI. CAN DIFFERENCES BETWEEN RECOGNIZED AND DISCLOSED ITEMS BE MODELED ANALYTICALLY?

One approach to modeling differences between recognized and disclosed items focuses on information properties. While this focus may seem roughly consistent with SFAC No. 5's implicit reliability-based distinction between recognized and disclosed items, models that focus on information properties must specify *which* properties distinguish recognized from disclosed items. To the extent those specifications identify properties that are inconsistent with SFAC No. 5's implicit reliability-based characterization, there will not be a link between analytical models and the FASB's conceptual framework.

Analytical distinctions between disclosure and recognition might take at least four forms. First, the model might exogenously specify a difference in an information property such as bias or variance. Second, the model might take a management (or auditor) perspective that distinguishes recognized items as differentially affected by management (or auditor) interventions. For example, recognized items might be assumed to be subject to more (or fewer) manipulations than disclosed items or recognized items might be assumed to be more precise because both managers and auditors exert more effort for those items. Third, items might be distinguished by the degree to which they are imperfect indicators of realized cash flows, with the probability an item will be disclosed and not recognized increasing in the degree of imperfection. Finally, disclosure and recognition might be modeled as two signals that differ in either their availability or their use. For example, the signal representing recognized items could be modeled as widely available and interpreted the same way by all investors; the signal representing disclosed items could be modeled as less available, or not interpreted the same way by all investors.

Implicit in these approaches is the need to make assumptions about investors. If the model treats investors as rational agents who fully understand the properties of the information they receive, then placement of the information, per se, cannot matter. Only differences in information properties, including availability, can matter.[25] Alternatively, models have been developed that relax assumptions that investors are rational, identical, and unconstrained in terms of information processing.

Several models separate disclosure from recognition by characterizing disclosures as information that is available to all, but less used by some investors. For example, Barth et al. (2003) posit that two pieces of information are provided to all. One piece of information is costless to use, but investors must incur a cost to gain the expertise necessary to understand the second piece of information, and not all choose to do so. The model associates the first type of information with recognition and the second type with disclosures. In this setting, items of the second type (i.e., the disclosures) receive a lower valuation weight because some investors do not understand those items.[26] As another example, Hirshleifer and Teoh (2003) assume that some investors use *only* salient (i.e., recognized) information and ignore both other (disclosed) items and prices. Pricing outcomes in this model are determined by the form of investor (in)attention and the relation between the salient and

---

[25] In a laboratory market, Bloomfield and Libby (1996) document that information availability has capital market effects. Specifically, they test whether making unfavorable information available to only half the traders in their market causes prices to be higher, and find that it does. They conclude that information availability matters because of the inability of the market mechanism to aggregate the information held by differently informed investors, not because of investor bias in interpreting the available information.

[26] Barth et al.'s (2003) analysis is carried out in a disaggregation setting. They consider how varying the relative and incremental quality of the easy-to-use and hard-to-use signals provides insights about display of the two signals. For example, if the hard-to-use signal has high quality, then the solution is to show it separately as a line item, along with the easy-to-use signal.

the ignored information. For example, investors might predict earnings using the firm's overall growth rate, ignoring differential growth rates provided by segment disclosures; outcomes will depend on the relation between the overall growth rate and the segment growth rates.

Lambert's (2003) discussion of Hirshleifer and Teoh's (2003) model raises several issues that are pertinent to both researchers and standard setters. First, he questions the assumption that investors who use only salient information would ignore prices (which seem extremely salient). In general, standard setters seem unwilling to assume that investors ignore share prices (even if they might ignore disclosed information). Second, Lambert (2003) notes that the model requires an understanding of both the *specific form* of inattention to disclosed information and the *specific relation* between disclosed and recognized information. For the most part, standard setters do not appear to include either differential expertise among financial statement users, or the specific relations among information items, in the decision criteria for separating recognition from disclosure.

From a policy perspective, models that document economic effects because of some combination of information availability and ease of use raise questions about how to make financial reporting information readily available and easy to use. With regard to availability, I believe that the settings in these models capture certain aspects of a real-world phenomenon, albeit in an extreme way: the systematic exclusion of most required disclosures from commercially available machine-readable databases. Investors who use these databases—for whatever purpose—are similar to Bloomfield and Libby's (1996) traders who have only the widely available signal. Or, alternatively, they are like Hirshleifer and Teoh's (2003) investors who face a system (the database) that separates items into those that are included in the database (salient and attended to) and those that are not included (not salient and hence not attended to), or they are like Barth et al.'s (2003) investors who must incur a cost to understand a piece of information. The point is that any mechanism, including commercial databases of financial report information, that systematically excludes disclosed information makes that information less available (less salient, more costly to use) than would a more inclusive mechanism.[27] To the extent judgments and decisions made by certain classes of investors are predicated on, or even just influenced by, the items included in commercial databases, and those databases do not include—that is, make readily available and salient—certain disclosed items, those disclosed items may well appear to be used less by certain classes of investors, for certain classes of decisions. The signs and magnitudes of any effects are an empirical matter.

With regard to ease-of-use, and setting aside the question of inclusion or exclusion in commercial databases, if some piece of possibly hard-to-understand information is intrinsically informative to investors, then should the standard setter create guidance (rules) whose application will make that information easier to use and if yes, how should this be done? Certainly, this is a question that has been considered (although not in the same way it is stated here) by the FASB. For example, in SFAS No. 155, the FASB decided that hybrid instruments measured at fair value and those measured at other than fair value should be displayed (recognized) separately on the balance sheet, not disclosed in the notes, to make the difference in measurement attributes more salient to users. In addition, required tabular reconciliations (e.g., of warranty costs per paragraph 14 of FASB Interpretation No. 45, *Guarantors' Accounting and Disclosure Requirements for Guarantees, Including Indirect Guarantees of the Indebtedness of Others*, and of restructuring costs per paragraph 20 of

---

[27] This comment ignores the cost to acquire the database, which I view as sunk for any specific information use.

SFAS No. 146, *Accounting for Costs Associated with Exit or Disposal Activities*) are intended to make information easier to understand and use. It is an empirical question whether the disclosures achieve this intended effect.

VII. DO USERS OF FINANCIAL STATEMENTS PROCESS RECOGNIZED AND DISCLOSED ITEMS DIFFERENTLY?

The previous section provided examples of analytical models that posit different types of investors who process information differently depending on its availability or ease of use. However, some streams of empirical archival research assume such processing differences either do not exist or do not matter. This section considers what research tells us about how investors use (or do not use) disclosed versus recognized items. I discuss three views on this issue.

First, a "no differences" view posits that once an item has entered the financial reports, location and presentation (the face of the financial statements versus the notes) have no direct implications; all communications in financial reports are processed based on their informational properties, not on how and where they are displayed. This view is consistent with investors as rational, knowledgeable, not constrained by cognitive limitations, and not ascribing any meaning to how information is presented (that is, the standard setter's decision to require disclosure instead of recognition does not, in and of itself, convey any information). Under this view, reliability differences between recognized and disclosed items are detected and adjusted for (if they exist at all). An example of this perspective is Aboody et al. (2004, 127): "In an efficient market, the decision to recognize a disclosed amount conveys no new information."

Second, a "rational differences" view posits that location (disclosure versus recognition) has implications because an item's location reveals something about its decision usefulness. This view is consistent with rational investors who look to financial reporting requirements to reveal pertinent information characteristics of disclosed versus recognized items and with SFAC No. 5's implicit characterization of disclosures as less reliable than recognized items. A "rational differences" view of recognition and disclosure, in which the standard setter's decision about the location of information reveals something about that information, seems to underlie some archival research (e.g., Davis-Friday et al. 2004).

Third, a "user characteristics" view posits that recognition versus disclosure distinctions derive from factors that are intrinsic to users of financial reports and not the information in those reports. This view is consistent with users who ignore or underweight disclosed items, or process them differently from recognized items, for cognitive reasons. For example, financial statement users might lack some combination of problem-solving ability, knowledge, and ability and willingness to process disclosed items thoroughly. This third view is most easily investigated using experimental studies of financial statement users.

Such experimental studies start with the identification of a user group—clearly, user groups will differ in problem-solving ability, knowledge, and ability and willingness to process information thoroughly. Possible user groups include: investors, whose judgments and decisions are aggregated and summarized in share prices; financial intermediaries (sell-side analysts, buy-side analysts, credit analysts); creditors, whose judgments and decisions are aggregated into lending decisions or the terms of loan contracts; and internal decision

P30815

makers, such as boards of directors.[28] Accounting research has used, as users of financial statements, M.B.A. students with business and investing experience (e.g., Maines and McDaniel 2000; Koonce et al. 2005), nonspecialist buy-side analysts (Hirst and Hopkins 1998), and buy-side analysts with specific expertise in the disclosure being examined (Hirst et al. 2004). With some exceptions, interpretations of this research do not turn on how researchers have identified financial statement users; however, I return to notions of differences in information-processing abilities among user groups later in this section.

Research Indicates Users of Financial Statements Treat Disclosed Items Differently from Recognized Items

In my view, the weight of the experimental evidence on users of financial statements indicates they underweight disclosures, or even ignore them altogether. For example, both Maines and McDonald (2000), users are nonprofessional investors, and Hirst and Hopkins (1998), users are buy-side analysts, find that when other comprehensive income is not shown on a single statement along with earnings (that is, it is presented like a disclosure), many users simply do not seem to use that information.

Similarly, experimental research finds differences in information use depending on whether the information is explicitly displayed or able to be inferred (calculated) from knowledgeable analysis of information that is provided. Specifically, research shows that users tend not to do the work required to analyze information and draw inferences—they use what is explicitly presented. For example, Dietrich et al. (2001), users are students who had taken intermediate accounting and completed a professional internship, find in a laboratory markets setting that explicit disclosure of managements' best estimate of an uncertain amount improves market efficiency, even though that estimate is redundant (it can be inferred from information that is provided).[29] The authors conclude that their results support the view that "decision makers tend to avoid cognitive effort by using information in the form in which it is presented" (Dietrich et al. 2001, 265).

Research also shows that even experts are subject to this processing bias. Hirst et al. (2004), users are bank analysts, find that information usage differs depending on whether fair values are explicitly shown on the balance sheet and income statement, or can be inferred from analysis of recognized and disclosed information. These results are particularly striking because they are obtained, in an experimental setting, with professional bank analysts and an experimental task that involves assessing bank core operations.

Why Would Users of Financial Reports Treat Recognized and Disclosed Items Differently?

Accounting research suggests at least two behavioral reasons why users might treat recognized items differently from disclosed items. The first reason relates to competence (knowledge, effort, and ability) and the second relates to certain features of human information processing that may be intrinsic (i.e., not appreciably affected by incentives or expertise).

With regard to the first reason, research previously cited, including Imhoff et al. (1995), Dietrich et al. (2001), and Hirst et al. (2004), suggests that financial statement users rely on salient, readily available information and simple heuristics.[30] They do not make complex calculations that require significant knowledge. However, this research does not attempt to explain why this is so.

---

[28] Little is known about how corporate boards of directors process accounting information in reaching decisions about, for example, capital structure, acquisitions, divestitures, and compensation. With regard to the last of these, Imhoff et al. (1995) provide evidence that determination of CEO compensation appears to disregard operating lease disclosures.

[29] In this setting, reliability was not an issue—"disclosures provided error free information" (Dietrich et al. 2001, 265).

In research with implications for why financial statement users appear to use simple heuristics instead of more accurate (and more complex) calculations, Dearman and Shields (2005) focus explicitly on how competence affects information processing. They found that student subjects with high levels of motivation, problem-solving ability, and subject matter knowledge were able to adjust product costing information to take account of bias introduced by using a volume-based system, while those who lacked a high level of *any one* of the three attributes did not make the necessary adjustment.[31] Their research design is demanding, requiring 32 pricing decisions under each of two costing regimes of each subject, as well as psychometric testing to determine knowledge, problem-solving ability, and intrinsic motivation; such designs may not be feasible in settings involving analyst-subjects instead of student-subjects.

Dearman and Shields (2005) suggest (and I concur) that researchers should take a positive focus on the characteristics of users, and perhaps user groups, who appear to use information fully, as opposed to a continued documentation that most (or the average or median) users do not. Clearly, expert users exist even in experiments where most of the subjects did not fully and rationally use disclosed information, and it may be possible to understand something about how (and why) expertise, effort, and problem-solving ability affect the use of disclosed information by considering their behaviors.[32]

With regard to the second reason why financial statement users might treat disclosed items differently, some research posits certain biases in information processing (e.g., a tendency to "anchor") that appear to be impervious to incentives, knowledge, and problem-solving ability.[33] For example, Koonce et al. (2005) show that judgments about the risk of financial items are a function of both factors predicted by decision theory (probabilities and outcomes) and certain emotional or affective factors (dread, including worry, newness and immediacy, and uncertainty). The two kinds of factors are linked in their influence by the amount of potential loss, which affects both dread and the actual risk. As another example, Hobson and Kachelmeier (2005) show in a laboratory markets setting that anchoring (i.e., excessive reliance on the form and content of explicit disclosures) persists in the face of economic incentives to behave otherwise.

Interestingly, both Koonce et al. (2005) and Hobson and Kachelmeier (2005) document that cognitive biases and economically rational behavior appear to coexist in the same experimental subjects, with neither driving out the other. That is, Koonce et al. (2005) find that judgments are influenced by factors predicted by decision theory (as well as affective factors), and Hobson and Kachelmeier (2005) find that users of disclosures also systematically discount disclosed information when they know that the disclosures are made strategically (as well as anchor). Thus, research documents *both* cognitive biases *and* rational behavior on the part of users with regard to understanding at least some implications of strategic disclosure choice (Hobson and Kachelmeier 2005) and with regard to basing judgments at least partly on economic factors (Koonce et al. 2005). Standard setting would benefit from a thorough understanding of both the nature of users' cognitive biases and the influence of economic forces on those biases.[34]

---

[30] For example, Imhoff et al. (1995, 70) conclude that "the manner in which they [capital market participants] respond [to lease footnote information] is consistent with a naïve use of footnote disclosures."

[31] The experiment began with 113 students, of which 25 were eliminated because they did not understand the task. Of the remaining subjects, 24 were judged low on all three attributes (motivation, subject matter knowledge, and problem-solving ability). Of 16 subjects who correctly adjusted the product cost, 13 were judged high on all three attributes. Two subjects who performed an incorrect adjustment analysis were judged high on effort and problem solving and low on subject matter knowledge.

[32] For example, Hirst and Hopkins (1998) provided three displays of other comprehensive income (OCI): a one-page statement of earnings and OCI; a two-page display with OCI shown in a statement of shareholders equity; and presentation of OCI in the notes. In every case, *some* of the subjects (albeit sometimes a significant minority) obtained and used the information.

[33] Interestingly, however, Hodge et al. 2004, show that using certain search-facilitating technologies (e.g., XBRL) seems to increase the likelihood that disclosed information would be acquired and used.

VIII. CONCLUDING COMMENTS

This discussion has considered required disclosures in financial reports from several perspectives. First, existing disclosure requirements have been developed without the benefit of guidance that would be provided by either some generally accepted theory of required disclosures or a standard setter's conceptual framework for disclosures. While SFAC No. 5 implies that disclosed items may be distinguished from recognized items by lower reliability, suggesting that the purpose of required disclosures is to present items that are relevant but cannot be measured with the requisite amount of reliability, analysis of standards reveals that this distinction does not explain existing disclosure requirements.

Evidence on whether disclosed amounts are less reliable than recognized amounts suggests reliability differences exist, and may be due to differences in the preparation and auditing of disclosed versus recognized amounts, as opposed to intrinsic differences. However, it is not clear, from existing research, *why* preparers and auditors might treat recognized items with more care than disclosed items.

Analysis of existing standards suggests that standard setters derive requirements for disclosures from a context-specific consideration of judgments and decisions that users of financial reports might make. There is no systematic evidence that standard setters act as if they believe that users cannot understand and use disclosed items as easily as they understand and use recognized items. However, research suggests that users do in fact process disclosed items differently from, and probably less thoroughly than, recognized items. It is unclear what causes this difference, and how much the difference might matter for capital market outcomes. In particular, processing differences that arise because of a lack of financial statement user attention and expertise (they do not closely attend to and/or understand disclosures) are amenable to interventions in the form of better education and training. On the other hand, processing differences that arise because of cognitive factors that are impervious to education and incentives might require standard setter consideration in setting disclosure requirements.

REFERENCES

Aboody, D., M. Barth, and R. Kasznik. 2004. Firms' voluntary recognition of stock-based compensation expense. *Journal of Accounting Research* 42 (May): 123–150.

Ahmed, A., E. Kilic, and G. Lobo. 2006. Does recognition versus disclosure matter? Evidence from value-relevance of banks' recognized and disclosed derivative financial instruments. *The Accounting Review* 81 (3): 567–588.

---

[34] For example, Hobson and Kachelmeier (2005, 844) suggest that preparers might "favor disclosure options that are more difficult or less difficult for users to process, depending on the circumstances." They point to the predominance of the presentation of Other Comprehensive Income in a statement of shareholders equity (because this presentation makes volatility in comprehensive income more difficult to detect).

Barth, M. 1991. Relative measurement errors among alternative pension asset and liability measures. *The Accounting Review* 66: 433–463.

———, and C. Murphy. 1994. Required financial statement disclosures: Purposes, subject, number and trends. *Accounting Horizons* 8: 1–22.

———, G. Clinch, and T. Shibano. 2003. Market effects of recognition and disclosure. *Journal of Accounting Research* 41 (September): 581–609.

Beaver, W., and M. Venkatachalam. 2003. Differential pricing of components of bank loan fair values. *Journal of Accounting, Auditing & Finance* 18 (1): 41–67.

Bloomfield, R., and R. Libby. 1996. Market reactions to differentially available information in the laboratory. *Journal of Accounting Research* 34 (Autumn): 183–207.

Boone, J. 2002. Revisiting the reportedly weak value relevance of oil and gas asset present values: The roles of measurement error, model misspecification, and time-period idiosyncrasy. *The Accounting Review* 77 (January): 73–106.

Bullen, H., and K. Crook. 2005. Revisiting the concepts: A new conceptual framework project. Financial Accounting Standards Board and International Accounting Standards Board. Available at: http://www.fasb.org/articles&reports/revisiting_the_concepts_may_05.pdf.

Choi, B., D. Collins, and W. B. Johnson. 1997. Valuation implications of reliability differences: The case of nonpension postretirement obligations. *The Accounting Review* 72: 351–383.

Cole, C., and C. Jones. 2004. The usefulness of MD&A disclosures in the retail industry. *Journal of Accounting, Auditing & Finance* 19 (Fall): 361–388.

Cotter, J., and I. Zimmer. 2003. Disclosure versus recognition: The case of asset revaluations. *Asia-Pacific Journal of Accounting & Economics* 10 (June): 81–99.

Davis-Friday, P., L. Folami, C. Liu, H. Mittelstaedt. 1999. The value relevance of financial statement recognition vs. disclosure: Evidence from SFAS No. 106. *The Accounting Review* 74 (October): 403–423.

———, C. Liu, and H. Mittelstaedt. 2004. Recognition and disclosure reliability: Evidence from SFAS No. 106. *Contemporary Accounting Research* 21 (Summer): 399–429.

Dearman, D., and M. Shields. 2005. Avoiding accounting fixation: Determinants of cognitive adaptation to differences in accounting method. *Contemporary Accounting Research* 22 (Summer): 351–384.

Dechow, P., and I. Dichev. 2002. The quality of accruals and earnings: The role of accrual estimation errors. *The Accounting Review* 77 (Supplement): 35–59.

Dietrich, J., S. Kachelmeier, D. Kleinmuntz, and T. Linsmeier. 2001. Market efficiency, bounded rationality, and supplemental business reporting disclosures. *Journal of Accounting Research* 39 (September): 243–268.

Dopuch, N., and M. Pincus. 1988. Evidence on the choice of inventory accounting methods: LIFO versus FIFO. *Journal of Accounting Research* 26: 28–59.

Dye, R., 2001. An evaluation of "essays on disclosure" and the disclosure literature in accounting. *Journal of Accounting and Economics* 32 (1–3): 181–235.

Frederickson, J., F. Hodge, and J. Pratt. 2006. The evolution of stock option accounting: Disclosure, voluntary recognition, mandated recognition and management disavowals. *The Accounting Review* 81 (5): 1073–1093.

Groves, R. 1994. Financial disclosure: When more is not better. *Financial Executive* 10 (3): 11.

Hirshleifer, D., and S. H. Teoh. 2003. Limited attention, information disclosure, and financial reporting. *Journal of Accounting and Economics* 36 (December): 337–386.

Hirst, E., and P. Hopkins. 1998. Comprehensive income reporting and analysts' valuation judgments. *Journal of Accounting Research* 36: 47–75.

———, P. Hopkins, and J. Wahlen. 2004. Fair values, income measurement, and bank analysts' risk and valuation judgments. *The Accounting Review* 79: 453–472.

Hobson, J., and S. Kachelmeier. 2005. Strategic disclosure of risky prospects: A laboratory experiment. *The Accounting Review* 80 (3): 825–846.

Hodge, F., J. Kennedy and L. Maines. 2004. Does search-facilitating technology improve the transparency of financial reporting? *The Accounting Review* 79: 687–703.

Imhoff, E., and J. Thomas. 1988. Economic consequences of accounting standards: The lease disclosure rule change. *Journal of Accounting and Economics* 10: 277–310.

———, R. Lipe, and D. Wright. 1991. Operating leases: Impact of constructive capitalization. *Accounting Horizons* 5: 51–63.

———, ———, and ———. 1993. The effects of recognition versus disclosure on shareholder risk and executive compensation. *Journal of Accounting Auditing & Finance* 8: 335–368.

———, ———, and ———. 1995. Is footnote disclosure an adequate alternative to financial statement recognition? *The Journal of Financial Statement Analysis* 1 (Fall): 70–81.

Jones, J. 1991. Earnings management during import relief investigations. *Journal of Accounting Research* 29 (Autumn): 193–228.

Jorion, P. 2002. How informative are value-at-risk disclosures? *The Accounting Review* 77: 911–931.

Koonce, L., M. McAnally, and M. Mercer. 2005. How do investors judge the risk of financial items? *The Accounting Review* 80 (January): 221–241.

Lambert, R. 2003. Discussion of: Limited attention, information disclosure, and financial reporting. *Journal of Accounting and Economics* 36 (December): 387–400.

Larcker, D., and T. Rusticus. 2005. On the use of instrumental variables in accounting research. Working paper, University of Pennsylvania.

Libby, R., M. Nelson, and J. Hunton. 2006. Recognition v. disclosure, auditor tolerance for misstatement, and the reliability of stock-compensation and lease information. *Journal of Accounting Research* 44 (3): 533.

Linsmeier, T., D. Thornton, M. Venkatachalam, and M. Welker. 2002. The effect of mandated market risk disclosures on trading volume sensitivity to interest rate, exchange rate, and commodity price movements. *The Accounting Review* 77 (April): 343–377.

Lys, T., and L. Vincent. 1995. An analysis of value destruction in AT&T's acquisition of NCR. *Journal of Financial Economics* 39: 353–378.

Maines, L., and L. McDaniel. 2000. Effects of comprehensive-income characteristics on nonprofessional investors' judgments: The role of financial statement presentation format. *The Accounting Review* 75 (April): 179–207.

Niu, F., and G. Richardson. 2006. Are securitizations in substance sales or secured borrowings: Capital market evidence. *Contemporary Accounting Research* 23 (4): 1105–1133.

Sribunnak, V., and F. Wong. 2006. The impact of excluding nonfinancial risk exposure on the usefulness of foreign exchange sensitivity-analysis risk disclosures. *Journal of Accounting, Auditing & Finance* 21 (1): 1–25.

Street, D., N. Nichols, and S. Gray. 2000. Segment disclosures under SFAS No. 131: Has business segment reporting improved? *Accounting Horizons* 14 (3): 259–285.

Thornton, D., and M. Welker. 2004. The effect of oil and gas producers' FRR No. 48 disclosures on investors' risk assessments. *Journal of Accounting, Auditing & Finance* 19 (Winter): 85–114.

Verrecchia, R. 2001. Essays on disclosure. *Journal of Accounting and Economics* 32 (1–3): 97–180.

Wahlen, J. 2003. Discussion of: Differential pricing of components of bank loan fair values. *Journal of Accounting, Auditing & Finance* 18 (1): 69–77.

Wiedman, C., and H. Wier. 1999. Management of note disclosures: The case of unconsolidated subsidiaries prior to FAS No. 94. *Journal of Accounting, Auditing & Finance* 14 (1): 73–94.

Wong, M. 2000. The association between SFAS No. 119 derivatives disclosures and the foreign exchange risk exposure of manufacturing firms. *Journal of Accounting Research* 38 (Autumn): 387–417.

THE ACCOUNTING REVIEW
Vol. 82, No. 2
2007
pp. 327–357

The Role of Accounting in the Design of CEO Equity Compensation

Mary Ellen Carter
University of Pennsylvania

Luann J. Lynch
University of Virginia

İrem Tuna
University of Pennsylvania

ABSTRACT: We examine the role of accounting in CEO equity compensation design. For a sample of ExecuComp firms in 1995–2001, we find that financial reporting concerns are positively related to stock option use and total compensation, and negatively related to the use of restricted stock. We confirm our findings by examining changes in CEO compensation in firms that begin expensing options in 2002 or 2003. We find that these firms reduce their option use and increase their restricted stock use after starting to expense options but exhibit no decrease in total compensation. Taken together, our analyses suggest that favorable accounting treatment for options led to a higher use of options and lower use of restricted stock than would have been the case absent accounting considerations.

I. INTRODUCTION

In this paper, we examine the role of accounting in CEO equity compensation. Specifically, we investigate whether favorable accounting treatment for stock options that was available until very recently affected their use and the use of restricted stock. We further substantiate the role of accounting in equity compensation by examining whether firms that start expensing options shift CEOs' equity compensation away from options and into restricted stock.

Prior work models the choice of stock options and restricted stock (e.g., Lambert and Larcker 2004; Oyer and Schaefer 2005; Hall and Murphy 2002; Feltham and Wu 2001). These models lead to different predictions about the preferable form of equity compensation

---

We thank John Core, Dan Dhaliwal (editor), Joseph Gerakos, Tim Gray, Wayne Guay, Raffi Indjejikian, Chris Ittner, Dave Larcker, Francisco de Asis Martinez-Jerez, Tjomme Rusticus, two anonymous reviewers, and seminar participants at the 2005 American Accounting Association Management Accounting Conference, 2005 American Accounting Association Financial Accounting and Reporting Conference, Babson College, Boston College, and University of Pennsylvania for their helpful comments. We gratefully acknowledge the financial support of The Wharton School and the University of Virginia Darden School Foundation. We thank I/B/E/S for providing analyst forecast data.

Editor's note: This paper was accepted by Dan Dhaliwal.

Submitted April 2005
Accepted August 2006

based on the assumptions embedded in the models and type of analysis employed. However, despite the prediction of some models that firms should prefer restricted stock over stock options, empirical evidence suggests that it is rarely used in practice. Only approximately 20 percent of ExecuComp firms granted restricted stock to their CEOs between 1995 and 2001, while approximately 80 percent granted options during that period.

Hall and Murphy (2002) suggest that one missing, but important, parameter in existing models of the choice between options and restricted stock is the previously available favorable accounting treatment for options. Under the previous accounting for stock options, SFAS No. 123, *Accounting for Stock-Based Compensation* (Financial Accounting Standards Board [FASB] 1995), firms could account for options using either the fair value or the intrinsic value method prescribed by APB No. 25. Firms that used the intrinsic value method generally did not record compensation expense for options, but had to disclose the amount of expense that would have been recorded if they had used the fair value method.[1,2] Few firms expensed options under SFAS No. 123, consistent with their being concerned that doing so would decrease earnings. Indeed, Oyer and Schaefer (2006) report that the median firm may have been willing to incur real costs of up to $0.50 to $1 to issue options and save $1 in compensation expense.

However, prior literature is inconclusive on whether the favorable accounting for stock options motivated their use. Dechow et al. (1996) find no systematic evidence that opposition in response to FASB's 1993 Exposure Draft proposing the expensing of options resulted from concerns about the effect on earnings of recording the expense. Likewise, Aboody et al. (2004a) find that firms voluntarily recognizing stock-based compensation expense under SFAS No. 123 have significantly lower expense than do other firms. But, they find no significant relation between the decision to expense and the magnitude of that expense after controlling for other factors. Core and Guay (1999) and Matsunaga (1995) detect some evidence of a relation between financial reporting costs and options use, but Yermack (1995) and Bryan et al. (2000) find no reliable relation. Other work in more specific settings suggests that accounting considerations may motivate firms to alter option contract terms (e.g., Carter and Lynch 2003, 2005). This mixed evidence has led to a call for research directly examining the effect of accounting on the use of options (Core et al. 2003); specifically, they say, "It is important for future research to examine the role of accounting in motivating firms to either increase or decrease their use of stock options ... the role of financial accounting for employee stock options is of considerable importance to firms, but is not well understood by economists."

The infrequent use of restricted stock despite some theoretical predictions to the contrary, the lack of consensus in the literature and resulting call for research on whether accounting influences the use of options, and the new accounting for options under SFAS No. 123(R) all make it important to ascertain the role that accounting carries in executive compensation plan design.

Using a sample of ExecuComp firms and data from 1995 to 2001, we provide evidence that financial reporting concerns affect firms' choices regarding equity compensation in CEO pay packages. We find that our proxy for financial reporting concerns, which is more comprehensive than those of prior studies, is positively related to the use of stock options

---

[1] Under the intrinsic value method, firms could avoid an expense for options by granting a fixed number of options with a fixed exercise price set at or above the price of the underlying stock on the grant date.

[2] On March 31, 2004, the Financial Accounting Standards Board (FASB) issued an exposure draft outlining the new accounting for stock options. For fiscal years beginning after June 15, 2005, firms are required to account for options using the fair-value method as defined in SFAS No. 123(R) (Financial Accounting Standards Board 2004).

and negatively related to the use of restricted stock during a period when very few firms were expensing stock options. This result suggests that the previously available favorable accounting treatment for stock options has influenced equity compensation. In addition, we find that our proxy for financial reporting concerns is positively related to total compensation, suggesting that the once favorable accounting treatment for stock options may have lead to higher overall CEO pay.

We complement our findings by examining changes in CEO compensation in firms upon their decision to expense options. This setting allows us to investigate the role of accounting without having to rely on a proxy for those financial reporting concerns. A decrease in the use of options once expensing began would be consistent with the favorable accounting treatment encouraging their use. Further, it may explain the puzzling empirical observations regarding the infrequent use of restricted stock during times of favorable accounting treatment for options and would support the assertion that accounting affects the design of executive compensation.

Using a sample of ExecuComp firms that begin to expense stock options in 2002 and 2003, we find that their use of options in CEO compensation decreases upon expensing them. We also find that they award more compensation in restricted stock relative to what they had granted previously. While we take steps to rule out the possibility that firms decreased the use of options and then decided to expense them, our results are subject to the caveat that we may not have completely ruled out this alternative explanation. Collectively, our results are consistent with the favorable accounting treatment for options in the pre-expensing period leading to an overweighting of options and an underweighting of restricted stock in executive pay packages. Finally, we detect no decrease in total compensation upon expensing. In combination with the positive association between financial reporting concerns and total CEO compensation in the pre-expensing period, this result suggests that firms find it difficult to downsize the large executive pay packages that may have resulted from the favorable accounting treatment for stock options.

In response to the call for research on the impact of accounting on option use, our results suggest that the method of accounting for options *has* affected decisions regarding their use. We find that firms more concerned about earnings used more options in their equity compensation due to the favorable accounting treatment for options; once firms start expensing stock options, they shift into restricted stock. Our analysis provides insight into changes that may occur in CEO equity compensation now that the FASB has made option expensing mandatory: while we may not see an overall decrease in CEO compensation, we expect a decline in stock option use and an increase in the use of restricted stock. Our results also help to reconcile the theoretical predictions regarding the use of restricted stock with the empirical observation that few firms use restricted stock. Consistent with Hall and Murphy (2002), our results suggest that models of firms' choices of equity compensation methods should include the accounting considerations.

Section II discusses related literature. Section III presents the hypotheses. Section IV examines the relation between financial reporting costs and the use of stock options before many firms began to expense stock options. Section V examines changes in CEO compensation upon firms expensing options. Finally, Section VI concludes.

II. BACKGROUND AND PRIOR LITERATURE

Models of the choice of stock options and restricted stock (e.g., Lambert and Larcker 2004; Oyer and Schaefer 2005; Hall and Murphy 2002; Feltham and Wu 2001) lead to different predictions about the preferable form of equity compensation based on the assumptions embedded in the models and type of analysis employed. Specifically, Oyer and

Schaefer (2005) show that options work better than restricted stock in attracting employees who are optimistic about the outlook of the company (because optimistic employees value options more highly than restricted stock), and in retaining employees (because the value of the options vary more with the labor market conditions than restricted stock). They also argue that the employee's risk aversion plays a role in compensation design. The more risk-averse the employee, the larger the discount in the value of options, and, hence, the greater the "risk cost." Consistent with this, Lambert and Larcker (2004) show that options generally dominate restricted stock in the optimal compensation contract. The advantage of options (equity with a non-zero exercise price) is that the principal has to "give away" less of the firm to the agent, thereby decreasing the compensation cost. They find that for highly risk-averse employees and highly volatile firms, the optimal compensation contract includes restricted stock as the only equity component. However, options re-enter the optimal contract if volatility further increases. Hall and Murphy (2002) find that firms prefer restricted stock when it is substituted for cash and that at-the-money options maximize incentives when they are granted in addition to existing pay packages. Feltham and Wu (2001) show that restricted stock is optimal when the agent can influence only the mean of the outcome, and options are optimal when the agent can influence both the mean and variance of the outcome.

Despite the predictions above that firms should prefer restricted stock under certain conditions, empirical evidence suggests they rarely do so. This is potentially due to two reasons. First, it is possible that the conditions under which restricted stock is preferred are seldom met. Alternatively, these models may be ignoring another factor that supports the dominance of stock options over restricted stock. Hall and Murphy (2002) suggest that one such missing, but key, factor in existing models of the choice between stock options and restricted stock is the previously favorable accounting treatment for stock options, which might have influenced their use. The accounting for stock options differed substantially from that for restricted stock. Firms granting restricted stock must record an expense associated with the grant.[3] However, before SFAS No. 123(R), firms that granted stock options were not required to record an expense if they granted a fixed number of stock options with a fixed exercise price equal to or greater than the market price on the grant date. Botosan and Plumlee (2001) report that for their sample of *Fortune*'s September 1999 listing of the 100 fastest-growing companies, recording stock option expense would have decreased earnings per share (EPS) by 14 percent and return on assets (ROA) by 13.6 percent; in other words, if firms had expensed options, the effect would be substantial.

Many studies examine the use of stock options in compensation contracts for CEOs, executives, and non-executive employees (e.g., Core and Guay 2001; Ryan and Wiggins 2001; Bryan et al. 2000; Core and Guay 1999; Kole 1997; Yermack 1995; Gaver and Gaver 1993; Smith and Watts 1992). Unlike stock options, prior research related to the use of restricted stock is limited, perhaps because of the low proportion of firms that incorporate restricted stock into the compensation plan. Kole (1997) and Gaver and Gaver (1993) examine the presence of plans to authorize the issuance of restricted stock, but cannot examine actual grants of restricted stock due to data availability constraints.[4] Bryan et al. (2000) and Ryan and Wiggins (2001) study actual restricted stock grants to CEOs during 1992–1997 and 1997, respectively. Ryan and Wiggins (2001) investigate the use of cash bonuses, stock options, and restricted stock, but do not consider the impact of financial reporting costs on compensation plan design. Bryan et al. (2000) examine various determinants of equity grants, but find no evidence that financial reporting costs are related to either options or restricted stock.

---

[3] The expense is equal to the value of the shares granted, amortized over the vesting period of the shares.

[4] Kole (1997) examines compensation plans in 1980; Gaver and Gaver (1993) examine compensation plans in 1985. Both studies examined time periods prior to the required disclosure of restricted stock grants.

Despite the research that exists regarding the choice of stock options and restricted stock, and despite the suggestion by Hall and Murphy (2002) that one important but often-omitted factor in studies that model that choice is the favorable accounting for stock options, prior literature provides inconclusive evidence on whether the accounting for stock options motivates their use. Dechow et al. (1996) find that opposition in response to FASB's 1993 Exposure Draft proposing the expensing of stock options resulted from concerns about reporting higher levels of executive compensation, but find no systematic evidence that the opposition resulted from concerns about the effect on earnings of recording the expense. Aboody et al. (2004a) examine firms' decisions to voluntarily recognize stock-based compensation expense under SFAS No. 123. They find that these decisions are related to the extent of capital market participation, private incentives of executives and the board of directors, the level of information asymmetry, and political costs. Despite finding that firms voluntarily recognizing an expense have significantly lower SFAS No. 123 expense than other firms, they find no significant relation between the decision to expense and the magnitude of that expense after controlling for other factors. They do find significant positive announcement returns for firms announcing their decision earlier, consistent with the announcement serving as a signal about reporting transparency and favorable future prospects.

Core and Guay (1999) find their proxy for financial reporting costs is positively related to the use of options for CEOs. Matsunaga (1995) finds some evidence of a weak relation between the use of options and financial reporting costs, although he points out that inconsistencies in his results across methods of estimation and time suggest the need for additional research. Kimbrough and Louis (2004) find that firms alter the proportion of compensation from options to meet certain earnings benchmarks, particularly when they expect to issue shares the following year. Other literature related to options suggests that firms may be motivated by accounting considerations to alter the terms of option contracts (see, e.g., Carter and Lynch 2003, 2005). However, Yermack (1995) and Bryan et al. (2000) do not find a reliable relation between options and financial reporting costs. This mixed evidence has led to a call for research on the effect that accounting standards have on the use of stock options (Core et al. 2003).

Based on the results of prior work, the role of accounting in equity compensation is unresolved. The lack of consensus in prior literature on whether the accounting for stock options promoted their use might stem from the proxies for financial reporting concerns used in these studies. Most proxies focus on (1) potential debt covenant violations, or (2) the extent to which earnings meet prior year earnings.[5]

Our analysis sheds light on the role of accounting in equity compensation in two ways. First, we develop a more comprehensive measure of firms' concerns about the effect of an expense on earnings. It incorporates multiple reasons why a company could incur financial reporting costs due to expensing stock options. Our proxy captures measures used in prior research. In addition, our proxy recognizes some stability in compensation over time—empirically, firms typically do not experience wide swings in compensation from year to year. Most of these prior studies mentioned above assume that firms adjust compensation packages substantially each year in response to the need to meet that year's earnings targets. Our proxy captures a more general concern about earnings patterns.

---

[5] Yermack (1995) uses interest coverage as a proxy for financial reporting costs, since firms with low interest coverage may be closer to violating debt covenants. Matsunaga (1995) uses a measure of (1) the extent to which "as if stock options were expensed" income is below a target level (a random walk with drift), because the firm enters into agreements that are either implicitly or explicitly based on reported income, and (2) the extent to which the firm uses income-increasing accounting methods. Bryan et al. (2000) use several measures similar to the first measure in Matsunaga (1995) and an interest coverage measure. Core and Guay (1999) use, as a proxy for financial reporting costs, whether retained earnings limit the firm's ability to pay dividends and repurchase stock. Specifically, a firm is constrained if [(year-end retained earnings + cash dividends and stock repurchases during the year)/prior year's cash dividends and stock repurchases] is less than 2.

Second, in addition to using a more comprehensive proxy, we further substantiate our conclusions by using the natural setting provided by firms' recent decisions to begin expensing options. This setting allows us to investigate the impact of accounting on equity compensation but eliminates the need to rely solely on a proxy for financial reporting concerns.

III. HYPOTHESIS DEVELOPMENT

The role that accounting plays in equity compensation is still an open debate. Some would argue that the favorable accounting treatment did not affect firms' decisions to use stock options. In other words, firms provide details regarding their options use in the financial statement footnotes (SFAS No. 123), and financial statement users can incorporate those details into their assessment of the firm (e.g., Aboody et al. 2004b). If so, then we would expect no association between perceived financial reporting costs from recognizing compensation expense and the design of CEO equity compensation prior to firms expensing options. We also would expect no change in CEO equity compensation design upon the decision to expense options. On the other hand, financial statement users may not incorporate footnote details into their assessment of the firm, perhaps because they are fixated on reported accounting earnings (Hand 1990) or because it is costly to adjust contracts for details in the footnotes (see, e.g., Espahbodi et al. 2002). If managers believe that this is the case, then we would expect firms that perceive higher financial costs of reporting compensation expense to rely more on options prior to expensing them. Further, we would expect a decrease in the use of options upon the decision to expense them if another form of equity compensation would have otherwise been preferable.

Theory provides mixed predictions on the role of restricted stock in equity compensation depending on the assumptions in the underlying models. Despite restricted stock being optimal in certain settings, few firms use it in executive compensation. It is possible that restricted stock is optimal, but as suggested by Hall and Murphy (2002), accounting considerations not modeled actually overshadowed their use. If firms limited their use of restricted stock because of differences in the accounting for options and restricted stock under SFAS No. 123, we would expect firms that perceived higher financial costs to reporting compensation expense to have relied less on restricted stock as a form of equity compensation for CEOs. In addition, we would expect an increase in the use of restricted stock upon the decision to expense options.

Finally, some have claimed that an increased use of stock options in response to favorable accounting treatment led to higher overall levels of executive compensation (see, e.g., Anderson et al. 2002). If so, then we would expect a positive association between perceived financial reporting costs and total CEO compensation. In addition, a decrease in total compensation upon firms' expensing options would suggest that the favorable accounting treatment for options resulted in higher levels of compensation. Alternatively, no decrease in total compensation upon firms' expensing options may also be consistent with such allegations. If the favorable accounting led to an increase in executive compensation in a pre-expensing regime, but firms find it difficult to decrease hefty executive pay levels afterwards, then they may substitute other forms of compensation for options rather than decrease the overall level of compensation if other forms of compensation were preferable but for the earnings effect.

IV. THE RELATION BETWEEN FINANCIAL REPORTING CONCERNS AND EQUITY COMPENSATION PRIOR TO EXPENSING OPTIONS

In this section, we examine whether financial reporting concerns are associated with equity compensation in 1995 to 2001, before a large number of firms began expensing stock options. Specifically, we are interested in the extent to which the favorable accounting treatment for stock options may have (1) motivated the use of options, (2) deterred the use of restricted stock, and (3) led to higher overall executive compensation. We estimate separate regressions of stock options, restricted stock, and total compensation on proxies for firms' financial reporting concerns and control variables that have been documented to explain compensation design.

Proxies for Financial Reporting Concerns

Our proxies for financial reporting concerns expand on variables used in prior research by encompassing several capital markets effects of earnings characteristics documented in the literature. First, the literature has identified circumstances under which particular earnings patterns or characteristics have positive effects on stock price (or negative effects when those patterns or characteristics no longer exist). Two important circumstances are (1) the need to maintain increasing earnings patterns (Barth et al. 1999; Burgstahler and Dichev 1997; Degeorge et al. 1999) and (2) pressure to meet analyst expectations (Burgstahler and Eames 1999; Degeorge et al. 1999; Abarbanell and Lehavy 2003; Bartov et al. 2002; Kasznik and McNichols 2001). Indeed, some of these studies suggest that firms enjoy a stock market premium that increases in the length of the string of earnings increases or meeting analyst expectations, making it more costly to break the string. In these circumstances, managers may act as if sustaining these patterns will prevent negative capital markets effects.

The literature also has identified capital-raising and contracting circumstances that may focus managers' attention on maintaining higher earnings. Indeed, Espahbodi et al. (2002) find that the need for additional capital and the possibility of debt covenant violations are related to concerns about expensing of stock options during the SFAS No. 123 debate. Accordingly, we consider three additional circumstances that may lead to concerns about reported earnings: (1) the need to meet debt covenants (Dichev and Skinner 2002; Watts and Zimmerman 1986, 1990; Sweeney 1994; DeFond and Jiambalvo 1994), (2) the need to access the equity markets (Teoh and Wong 1998; Teoh et al. 1998; Richardson et al. 2004), and (3) the need to issue debt (Anthony et al. 2004).

Since the use of stock options did not require the recording of compensation expense in our sample period, firms concerned about these capital markets effects of lower earnings may be more likely to use options in executive compensation. That is, firms with patterns of earnings increases, pressure to meet analyst expectations or debt covenant requirements, or plans to access capital markets may be revealing a higher general concern about the level of earnings. As a result, we expect these firms to be more likely to use stock options.

Based on prior literature discussed above, our proxies for concerns about financial reporting costs are: (1) the proportion of quarters (of all quarters that the firm appears on I/B/E/S) that the firm's EPS was equal to or greater than the prior year same quarter (*EPS_INCR*); (2) the proportion of quarters (of all quarters that the firm appears on I/B/E/S) that the firm met or beat analysts' EPS forecasts (*BEAT_FCST*): (3) the firm's ratio of debt to assets (*LEVERAGE*); (4) extent to which the firm accesses the equity markets in the upcoming year (*ISSUE_EQ*); and (5) extent to which the firm accesses the debt markets in the upcoming year (*ISSUE_DEBT*).[6] We obtain financial statement data from Compustat and analyst forecasts from I/B/E/S.

Since each proxy measures a firm's overall concern about financial reporting costs with error and because we are interested in a firm's general concern about financial reporting costs rather than in any one particular source of that concern, we aggregate these five characteristics using principal components analysis. This helps reduce the measurement error inherent in each individual component and allows us to incorporate multiple measures in a comprehensive yet parsimonious way. The analysis results in two factors with eigenvalues greater than 1, and for each factor we equally weight standardized factors that load with a value of greater than 0.45.[7] Our two factors are: (1) *FINRPT_1*, based on *EPS_INCR*, *BEAT_FCST*, and *LEVERAGE*, which captures general financial reporting concerns associated with participating in the capital markets, and (2) *FINRPT_2*, based on *ISSUE_EQ* and *ISSUE_DEBT*, which captures financial reporting concerns associated with plans to access the capital markets.[8] If the favorable accounting treatment for options increased the use of options, deterred the use of restricted stock, and increased overall executive compensation, then we would expect a positive (negative) relation between these variables and stock options and total compensation (restricted stock).[9]

We validate our proxies for a firm's overall financial reporting concerns using an out-of-sample analysis of firms that have taken actions that demonstrate a concern about financial reporting costs. Since under SFAS No. 123(R) option expensing is required only for unvested options over the vesting period, firms can accelerate the vesting of unvested options and avoid an expense under the new standard. Thus, we examine whether *FINRPT_1* and *FINRPT_2* are greater for firms that have accelerated the vesting of unvested options, as these firms appear to have done so for the purposes of avoiding an expense under SFAS No. 123(R) (Choudary et al. 2006). We obtain a sample of firms that accelerated the vesting of options from Bear Stearns Equity Research dated January 6, 2006 (Bear Stearns & Company, Inc. 2006). We calculate *FINRPT_1* and *FINRPT_2* for 2003 (latest possible data) for 2,192 firms on Compustat, of which 389 accelerated the vesting of options. The mean (median) of *FINRPT_1* is significantly greater for those firms accelerating vesting than those firms that are not, at $p < 0.01$ ($p < 0.01$). The mean (median) of *FINRPT_2* is greater for firms accelerating vesting than those firms that are not, though the difference is not significant ($p < 0.14$ and $p < 0.75$). Since firms began accelerating in 2004 and we measure future access to capital markets (*FINRPT_2*) in 2003, the lack of significance may result from our inability to measure this variable in 2005. Overall, this analysis provides some support that *FINRPT_1* and *FINRPT_2* are capturing firms' overall concerns about financial reporting costs.

---

[6] We calculate *LEVERAGE* as [(Compustat #34 + Compustat #9)/Compustat #6] in year $t-1$. We calculate *ISSUE_EQ* as [(the increase from year t to year $t+1$ in Compustat #85 + Compustat #210 + Compustat #130 − Compustat #88)/Compustat #6]. If this calculation yields a negative number, we replace the value with 0. We calculate *ISSUE_DEBT* as [(the increase from year t to year $t+1$ in Compustat #34 + Compustat #9)/Compustat #6]. If this calculation yields a negative number, we replace the value with 0. We use balance sheet information from Compustat to proxy for equity and debt issuances. Though the statement of cash flows would provide a more direct measure of equity and debt issuance, using the statement of cash flows would result in losing a significant portion of our sample due to missing data. The correlation between *ISSUE_EQ* (*ISSUE_DEBT*) using balance sheet information and *ISSUE_EQ* (*ISSUE_DEBT*) using statement of cash flow information for firms for which we have both is 0.66 (0.76).

[7] Interestingly, *LEVERAGE* has a negative loading. This is not consistent with these firms being concerned about violating debt covenants. Rather, it is consistent with these firms relying heavily on equity financing and thus being concerned about meeting the expectations of the equity markets. Because *LEVERAGE* loads negatively, we convert that variable to the proportion of assets that are equity financed.

[8] For the first factor, loadings for *EPS_INCR*, *BEAT_FCST*, and *LEVERAGE* are 0.80, 0.81, and 0.51, respectively. For the second factor, loadings for *ISSUE_EQ* and *ISSUE_DEBT* are 0.79 and 0.81, respectively.

[9] We also estimate the regressions using the individual components of *FINRPT_1* and *FINRPT_2*. Of the 15 coefficients (5 coefficients in each regression), 12 coefficients are of the predicted sign, and 8 of those 12 coefficients are significant at least at $p < 0.10$. However, the high correlation between these individual components clouds our ability to draw inferences when we include all variables in the regressions together. Therefore, we use principal components analysis to address this issue of multicollinearity and allow us to extract the common underlying construct represented by these variables.

Sample

Our sample consists of 6,242 CEO-year observations from ExecuComp for 1995 through 2001.[10] Table 1 presents descriptive statistics for the sample. Table 1, Panel A describes our sample selection. Out of 11,693 CEO-year observations with compensation data over the 1995–2001 period, 3,460 lack data to measure our financial reporting cost variable, and an additional 1,991 observations lack data for the control variables.

We obtain compensation data from ExecuComp. We obtain compensation from stock options (ExecuComp variable *BLK_VALUE*), compensation from restricted stock (ExecuComp variable *RSTKGRNT*), and total compensation (ExecuComp variable *TDC1*) for all executives identified by ExecuComp as the CEO.[11] We obtain financial statement data from Compustat.

The use of stock options increased steadily throughout the sample period (Table 1, Panel B). Specifically, the percent of sample firms granting options to CEOs increased from 76.5 percent in 1995 to 82.3 percent in 2001. Firms in the sample used very little restricted stock compared with options. However, the use of restricted stock to compensate CEOs increased steadily throughout the study period, from 18.0 percent of firms in 1995 to 21.6 percent of firms in 2001 (Table 1, Panel B). Panel C of Table 1 shows that the average firm in our sample awards \$3.1 million and \$0.4 million in options and restricted stock, respectively.

Multivariate Analysis

We estimate the following regression using pooled data for 1995 to 2001:[12]

$$\begin{aligned} DEP\_VBL_{jt} = {} & \alpha_0 + \alpha_1 FINRPT\_1_{jt} + \alpha_2 FINRPT\_2_{jt} + \alpha_3 DEV\_INC_{jt} \\ & + \alpha_4 CASH\_CONSTR_{jt} + \alpha_5 DIV\_YLD_{jt} + \alpha_6 EARN\_VOL_{jt} \\ & + \alpha_7 EQ\_CONSTR_{jt} + \alpha_8 TENURE_{jt} + \alpha_9 LNASSET_{jt} \\ & + \alpha_{10} BOOK\_MKT_{jt} + \alpha_{11} RET_{jt} + \alpha_{12} ln\_pre\_DEP\_VBL_{jt} + \varepsilon_{jt} \quad (1) \end{aligned}$$

where:

Dependent variables:
ln_OPT_{jt} = natural log of value of stock options granted to CEO of firm j in year t;
ln_RSTK_{jt} = natural log of value of restricted stock granted to CEO of firm j in year t; and

---

[10] This time period allows us to examine the relation between financial reporting costs and stock options after SFAS No. 123 was issued and before a large number of firms began expensing stock options.

[11] We eliminate part-year executives because compensation in those years for those executives may not be representative of annual compensation. For example, new executives frequently get hire-on equity grants (Doubleday and Fujii 2001).

[12] To mitigate the influence of outlying observations, we winsorize values *DEV_INC, CASH_CONSTR, DIV_YLD, EARN_VOL, EQ_CONSTR, TENURE, BOOK_MKT*, and *RET* that are below (above) the 1st (99th) percentile. Because of censoring in the equity grant data, we estimate Equation (1) using Tobit when *ln_OPT* and *ln_RSTK* are the dependent variables.

TABLE 1
Descriptive Statistics

Panel A: Sample Selection

Number of CEO-year observations in 1995–2001 with compensation data	11,693
Less: CEO-year observations missing data to measure financial reporting concerns	3,460
Less: CEO-year observations missing control variables	1,991
Final sample	6,242

Panel B: Proportion of Firms Granting Stock Options and Restricted Stock to CEOs

Percentage of Firms Granting	1995	1996	1997	1998	1999	2000	2001
Stock options to CEOs	76.5%	76.9%	76.8%	80.6%	80.8%	82.6%	82.3%
Restricted stock to CEOs	18.0%	18.8%	18.6%	19.9%	18.9%	19.4%	21.6%
Both options and restricted stock to CEOs	15.7%	16.1%	16.3%	17.9%	16.4%	16.1%	19.7%
n	783	853	858	890	925	919	1,014

Panel C: CEO Compensation and Financial Data for 6,242 Firm-Year Observations

Variable	Mean	Std. Dev.	Q1	Median	Q3
OPT ($)	$3,078,648	$13,006,230	$119,676	$743,737	$2,365,379
RSTK ($)	$432,694	$8,410,645	$0	$0	$0
FINRPT_1:					
EPS_INCR	0.735	0.167	0.619	0.735	0.869
BEAT_FCST	0.625	0.147	0.524	0.613	0.724
LEVERAGE	0.768	0.175	0.652	0.776	0.918
FINRPT_2:					
ISSUE_EQ	0.046	0.138	0.000	0.004	0.024
ISSUE_DEBT	0.059	0.126	0.000	0.001	0.061
DEV_INC	0.064	1.086	−0.615	0.036	0.713
CASH_CONSTR	0.023	0.088	−0.024	0.012	0.057
DIV_YIELD	0.013	0.016	0	0.006	0.021
EARN_VOL	0.008	0.027	0.000	0.001	0.004
EQ_CONSTR	0.134	0.152	0.048	0.090	0.163
TENURE	7.794	7.458	2	5	11
LNASSET	7.396	1.617	6.206	7.228	8.427
BOOK_MKT	0.470	0.365	0.232	0.391	0.606
RET	0.180	0.539	−0.149	0.107	0.392

Variable Definitions:

OPT_{jt} = value of stock options granted to CEO of firm j in year t;
$RSTK_{jt}$ = value of restricted stock granted to CEO of firm j in year t;
$FINRPT\_1_{jt}$ = factor created from principal component analysis equally weighting standardized values of *EPS_INCR*, *BEAT_FCST*, and *LEVERAGE* for firm j in year t;
EPS_INCR_{jt} = proportion of quarters on I/B/E/S, as of the end of year t, that firm j has reported increase in EPS over the same quarter in the prior year;
$BEAT\_FCST_{jt}$ = proportion of quarters on I/B/E/S, as of the end of year t, that firm j has beat analysts' EPS forecast;
$LEVERAGE_{jt}$ = (1 − debt/assets) for firm j in year t (see footnote 7);
$FINRPT\_2_{jt}$ = factor created from principal component analysis equally weighting standardized values of *ISSUE_EQ* and *ISSUE_DEBT* for firm j in year t;
$ISSUE\_EQ_{jt}$ = future increase in equity capital for firm j (year $t+1$) scaled by assets, 0 otherwise;
$ISSUE\_DEBT_{jt}$ = future increase in debt capital for firm j (year $t+1$) scaled by assets, 0 otherwise;
DEV_INC_{jt} = ln (actual incentive level/predicted incentive level) for year $t-1$, where actual incentive level is the delta of the equity portfolio and predicted incentive level is estimated from a model based on Core and Guay (1999) for the CEO in firm j;

(*continued on next page*)

TABLE 1 (continued)

$CASH\_CONSTR_{jt}$ = the three-year average over year $t-3$ to $t-1$ of [(Common and preferred dividends − cash flow from investing − cash flow from operations)/total assets] for firm *j*;

DIV_YLD_{jt} = the three-year average over year $t-3$ to $t-1$ of [dividends per share/price per share at the end of the year *t*] for firm *j*;

$EARN\_VOL_{jt}$ = the square of the standard deviation of ROA, where the standard deviation of ROA is calculated over ten years prior to year *t* for firm *j*;

EQ_CONSTR_{jt} = (executive options outstanding at the end of the year $t-1$/the three-year average over year $t-3$ to $t-1$ of percent of total options granted to executives)/total shares outstanding at the end of year $t-1$ for firm *j*;

$TENURE_{jt}$ = the number of years the CEO has been in that position (if missing, the number of years at the firm) in firm *j* as of the end of year *t*;

$LNASSET_{jt}$ = natural log of total assets at the end of year *t* for firm *j*;

$BOOK\_MKT_{jt}$ = book value of equity/market value of equity at the end of year *t* for firm *j*; and

RET_{jt} = cumulative 12-month returns for year *t* for firm *j*.

---

ln_TC_{jt} = natural log of total compensation to CEO of firm *j* in year *t*.

Independent variables:

$FINRPT\_1_{jt}$ = factor created from principal component analysis equally weighting standardized values of *EPS_INCR*, *BEAT_FCST*, and *LEVERAGE* for firm *j* in year *t*;

$FINRPT\_2_{jt}$ = factor created from principal component analysis equally weighting standardized values of *ISSUE_EQ* and *ISSUE_DEBT* for firm *j* in year *t*;

DEV_INC_{jt} = ln (actual incentive level/predicted incentive level) for year $t-1$, where actual incentive level is the delta of the equity portfolio and predicted incentive level is estimated from a model based on Core and Guay (1999) for the CEO of firm *j*;

$CASH\_CONSTR_{jt}$ = the three-year average over year $t-3$ to $t-1$ of [(Common and preferred dividends − cash flow from investing − cash flow from operations)/total assets] for firm *j*;

DIV_YLD_{jt} = three-year average over year $t-3$ to $t-1$ of [dividends per share/price per share at the end of the year *t*] for firm *j*;

$EARN\_VOL_{jt}$ = square of the standard deviation of ROA, where the standard deviation of ROA is calculated over ten years prior to year *t* for firm *j*;

EQ_CONSTR_{j} = (executive options outstanding at the end of the year $t-1$/the three-year average over year $t-3$ to $t-1$ of percent of total options granted to executives)/total shares outstanding for firm *j*;

$TENURE_{jt}$ = the number of years the CEO has been in that position (if missing, the number of years at the firm) for firm *j* as of the end of year *t*;

$LNASSET_{jt}$ = natural log of total assets for firm *j* at the end of year *t*;

$BOOK\_MKT_{jt}$ = book value of equity/market value of equity at the end of year *t* for firm *j*;

RET_{jt} = cumulative 12-month returns for year *t* for firm *j*;

$ln\_pre\_OPT_{jt}$ = natural log of value of stock options granted to CEO of firm *j* in year $t-1$;

$ln\_pre\_RSTK_{jt}$ = natural log of value of restricted stock granted to CEO of firm *j* in year $t-1$; and

$ln\_pre\_TC_{jt}$ = natural log of total compensation to CEO of firm *j* in year $t-1$.

To test our hypotheses, we examine the sign and significance of the coefficients on *FINRPT_1* and *FINRPT_2*.

Control Variables

We include control variables that are expected to influence CEO compensation. We include control variables for the choice of equity versus non-equity compensation (deviation from optimal incentives, cash constraints, equity constraints, risk aversion), variables that control for the form of the equity compensation used (dividend yield, volatility), and variables capturing standard determinants of compensation (size, investment opportunities, and performance).[13]

Deviation from predicted equity incentive levels (*DEV_INC*). Because firms grant equity to align the interests of executives with those of shareholders, changes in the CEO's equity portfolio from selling shares would change the incentive alignment and may require the firm to grant equity to adjust the overall level of equity incentives. We use the proxy developed in Core and Guay (1999) to control for equity grants that may result from the firm's need to adjust equity incentives. If the incentives inherent in an executive's equity portfolio are above (below) the predicted incentive level, then a lower (greater) use of equity grants is expected. Accordingly, we expect a negative relation between the deviation from this predicted equity incentive level and compensation from restricted stock and stock options.

We measure the deviation of the CEO's equity incentive levels from its predicted level (*DEV_INC*) as ln(actual incentive level/predicted incentive level) following the procedure in Core and Guay (1999).[14] That is, the actual incentive level is measured as the delta of the CEO's equity portfolio. The predicted level is determined from estimating a model of the level of equity incentives as a function of firm size, firm risk, growth opportunities, length of CEO employment, and free cash flow, including industry and yearly indicator variables.

Cash constraints (*CASH_CONSTR*). The use of restricted stock or stock options as compensation requires no cash outlay. Firms experiencing a shortage of cash may use equity as a substitute for cash compensation (Yermack 1995; Dechow et al. 1996). Accordingly, we expect a positive relation between cash shortfall and both restricted stock and stock options. Consistent with Core and Guay (1999), we measure cash constraints (*CASH_CONSTR*) as the three-year average of [(Common and preferred dividends − cash flow from investing − cash flow from operations)/total assets] so that a larger number represents a greater cash shortfall.

---

[13] It is possible that some of the variables determining the choice of equity versus non-equity compensation have varying degrees of importance in explaining the choice between options and restricted stock. For example, we might see more use of restricted stock than options when firms are more cash constrained because restricted stock is seen as a better substitute for cash compensation (Hall and Murphy 2002). If firms are more equity-constrained, we might see more restricted stock because the firm can commit less shares of restricted stock than options to convey the equivalent value to the executive. If executives are more risk-averse, then we might see more restricted stock because it always provides some positive intrinsic value to the executive (i.e., offers protection on the downside). Since the focus of our paper is on the role of accounting in equity compensation, we do not develop formal hypotheses around these control variables but acknowledge that they may represent trade-offs firms make.

[14] We do make a few modifications worth mentioning. First, our measure of the risk-free rate is from ExecuComp, and we make no attempt to match that measure against the maturity of the options. Second, in eliminating new option grants from executive equity portfolios, we first take those out of unexercisable options. If that results in a negative number, then we take all new option grants out of exercisable options. Despite these simplifying modifications, we are able to replicate the results in Core and Guay (1999) using their sample and time period.

Proximity to constraints on issuing equity (*EQ_CONSTR*). Firms that are close to their constraint on issuing equity may be more likely to offer cash compensation than equity compensation. Accordingly, we expect a negative relation between proximity to constraints on issuing equity and the use of stock options and restricted stock.

Ideally, we would measure the proximity to constraints on issuing equity as the ratio of issued to authorized shares. However, that information is not available in electronic form. Thus, we measure proximity to constraints on issuing equity as an estimate of the total options outstanding/total shares outstanding at the end of the year prior to the year of interest. We proxy for total options outstanding by dividing executive options outstanding [ExecuComp variable *UXNUMEX* + ExecuComp variable *UEXNUMUN*] at the end of the year prior to the year of interest by the average in the prior three years of percent of total options granted to executives [ExecuComp variable *PCTTOTOPT*].

Risk aversion of executives (*TENURE*). Executives who are more risk-averse may prefer the certainty of fixed compensation over the uncertainty of performance-based compensation. Accordingly, we expect a negative relation between the risk aversion of executives and the use of options and restricted stock.

We proxy for risk aversion using the length of time the CEO has held that position. Individuals in the same position longer likely feel more stable and secure and therefore are likely to be less risk-averse since the likelihood of CEO turnover decreases with tenure (Sebora 1996; Farber 1999; Allgood and Farrell 2000, 2003). Accordingly, we expect a positive relation between *TENURE* and both stock options and restricted stock.

We measure *TENURE* as the number of years the CEO has held that position (calculated from ExecuComp variable *BECAMECEO*), or if missing, the number of years an executive has been with the firm (calculated from ExecuComp variable *JOINED_CO*).

Dividend Yield (*DIV_YLD*). Stock options typically are not dividend protected (dividends do not accrue to the option holder), making options less valuable to the executive. Firms that pay high dividends may be less likely to use options as a form of compensation. Accordingly, we expect a negative relation between dividend yield and the use of stock options. Restricted stock typically is dividend protected (dividends do accrue to the stockholder), making restricted stock more valuable to the executive in dividend-paying firms. Firms that pay high dividends may be more likely to use restricted stock as a form of compensation. Accordingly, we expect a positive relation between dividend yield and the use of restricted stock.

Our proxy is the average dividend yield over the three-year period ending the year prior to the year of interest, where dividend yield (ExecuComp variable *DIVYIELD*) is measured as dividends per share/price per share at the end of the year. We use a three-year average because it likely better captures future expectations than using than just one (the prior) year data.

Volatility (*EARN_VOL*). Higher volatility firms may be more likely to grant restricted stock because restricted stock offers the holder some downside protection. Alternatively, higher volatility firms may be less likely to grant restricted stock because the likelihood of stock options being in the money is greater with higher volatility firms. Accordingly, we make no prediction regarding the relation between volatility and either options or restricted stock.

We measure volatility as the variance of ROA, where the variance of ROA is calculated over ten years prior to the year of interest using data from Compustat.

Standard economic determinants of compensation: size, investment opportunities, performance. First, as firm size increases, it may become more difficult to monitor managers' actions (see Smith and Watts 1992). If so, then larger firms may be more likely to use incentive compensation plans. Accordingly, we expect a positive relation between size and both stock options and restricted stock. We include the natural log of total assets (Compustat #6) at the end of the year (*LNASSET*) as a measure of firm size.

Second, since it is more difficult to observe managers' actions when the firm has more investment opportunities, firms with larger growth opportunities may be more likely to use equity compensation to link managers' incentives to firm value (see Smith and Watts 1992). We include book-to-market ratio at the end of the year (*BOOK_MKT*), measured as (Compustat #216 − Compustat #130)/(Compustat #25 × Compustat #199), as a proxy for growth opportunities and expect a negative relation between book-to-market and both options and restricted stock.

Third, Murphy (1985) finds that executive compensation is positively correlated with firm performance. Accordingly, we expect a positive relation between firm performance and options, restricted stock, and total compensation. Using data from CRSP, we measure performance as cumulative monthly stock returns in year *t* (*RET*).

We include industry indicator variables using the industry classifications from Barth et al. (1998).[15] This allows us to capture different labor market conditions in different industries and thus control for attraction or retention reasons that affect compensation design (Oyer and Schaefer 2005). Furthermore, industry indicators also control for other potential differences in pay practices across industries.

We include the previous year's option or restricted stock grant value (ln_*pre_OPT* or ln_*pre_RSTK*) or the previous year's total compensation (ln_*pre_TC*) to control for the determinants of compensation design that are not captured by the other control variables.[16] Finally, we include yearly indicators and estimate the statistical significance using Huber/White standard errors to adjust for any potential heteroscedasticity and serial correlation in the data.

Results

Table 2, Panel A presents the results of the regression of the natural logarithm of compensation from stock options on our independent variables. The amount of compensation from stock options is positively related to both *FINRPT_1* and *FINRPT_2* ($p < 0.01$ and $p < 0.05$, respectively), as expected. Compensation from stock options is greater for larger firms, higher growth firms, and firms with better performance, and smaller for firms with CEO equity incentives above predicted levels and firms with higher dividend yield, as expected. The sign of the coefficient on *TENURE* is contrary to predictions. It is possible that being in a position longer signals that an executive is risk-averse, so firms rely less heavily on variable compensation.[17] The coefficient on *EQ_CONSTR* also is contrary to predictions but likely reflects that our proxy for proximity to equity constraints is higher, by construction, for those firms that grant more options. In general, though, the results in Panel A are consistent with our hypothesis and suggest that firms more concerned about

---

[15] Barth et al. (1998) classify firms into 15 industry groupings according to four-digit SIC codes.

[16] Our conclusions are unchanged if this variable is excluded.

[17] It is also possible that longer tenure may indicate a CEO with greater wealth and thus greater risk aversion, suggesting a need for more pay, which firms offer in the form of equity compensation. Alternatively, it is possible that more talented CEOs with longer tenure demand higher equity-based pay. We thank an anonymous reviewer for suggesting these two alternative explanations.

TABLE 2
Regressions of the Level of CEO Compensation from Stock Options, Restricted Stock, and Total Compensation in 1995 through 2001 on Concern about Financial Reporting Costs and Other Factors

Panel A: Natural Logarithm of CEO Compensation from Stock Options

$$\begin{aligned} ln\_OPT_{jt} = {} & \alpha_0 + \alpha_1 FINRPT\_1_{jt} + \alpha_2 FINRPT\_2_{jt} + \alpha_3 DEV\_INC_{jt} + \alpha_4 CASH\_CONSTR_{jt} \\ & + \alpha_5 DIV\_YLD_{jt} + \alpha_6 EARN\_VOL_{jt} + \alpha_7 EQ\_CONSTR_{jt} + \alpha_8 TENURE_{jt} \\ & + \alpha_9 LNASSET_{jt} + \alpha_{10} BOOK\_MKT_{jt} + \alpha_{11} RET_{jt} + \alpha_{12} ln\_pre\_OPT_{jt} + \varepsilon_{jt}. \end{aligned}$$

Variable	Predicted Sign	Coefficient	z-statistic
Intercept	?	0.45	1.09
FINRPT_1	+	0.23	2.94***
FINRPT_2	+	0.11	2.05**
DEV_INC	−	−0.45	−7.63***
CASH_CONSTR	+	0.06	0.10
DIV_YLD	−	−13.70	−3.44***
EARN_VOL	?	1.36	0.73
EQ_CONSTR	−	1.99	4.53***
TENURE	+	−0.06	−7.11***
LNASSET	+	0.48	12.01***
BOOK_MKT	−	−0.50	−3.18***
RET	+	0.38	4.26***
ln_pre_OPT	+	0.38	15.41***
n		6,242	
Wald χ^2 statistic (p-value)		1,243.61 (0.00)	

Panel B: Natural Logarithm of CEO Compensation from Restricted Stock

$$\begin{aligned} ln\_RSTK_{jt} = {} & \alpha_0 + \alpha_1 FINRPT\_1_{jt} + \alpha_2 FINRPT\_2_{jt} + \alpha_3 DEV\_INC_{jt} + \alpha_4 CASH\_CONSTR_{jt} \\ & + \alpha_5 DIV\_YLD_{jt} + \alpha_6 EARN\_VOL_{jt} + \alpha_7 EQ\_CONSTR_{jt} + \alpha_8 TENURE_{jt} \\ & + \alpha_9 LNASSET_{jt} + \alpha_{10} BOOK\_MKT_{jt} + \alpha_{11} RET_{jt} + \alpha_{12} ln\_pre\_RSTK_{jt} + \varepsilon_{jt}. \end{aligned}$$

Variable	Predicted Sign	Coefficient	z-statistic
Intercept	?	−11.56	−9.21***
FINRPT_1	−	−0.62	−2.54***
FINRPT_2	−	0.14	0.80
DEV_INC	−	−0.43	−2.85***
CASH_CONSTR	+	−2.46	−1.29
DIV_YLD	+	32.83	2.66***
EARN_VOL	?	−11.21	−1.43
EQ_CONSTR	−	−1.09	−0.87
TENURE	+	−0.11	−4.77***
LNASSET	+	0.50	4.60***
BOOK_MKT	−	0.09	0.21
RET	+	0.84	2.68***
ln_pre_RSTK	+	1.58	33.72***
n		6,242	
Wald χ^2 statistic (p-value)		2,347.84 (0.00)	

(*continued on next page*)

TABLE 2 (continued)

Variable	Predicted Sign	Coefficient	z-statistic
Panel C: Natural Logarithm of Total CEO Compensation			

$$ln\_TC_{jt} = \alpha_0 + \alpha_1 FINRPT\_1_{jt} + \alpha_2 FINRPT\_2_{jt} + \alpha_3 DEV\_INC_{jt} + \alpha_4 CASH\_CONSTR_{jt} + \alpha_5 DIV\_YLD_{jt} + \alpha_6 EARN\_VOL_{jt} + \alpha_7 EQ\_CONSTR_{jt} + \alpha_8 TENURE_{jt} + \alpha_9 LNASSET_{jt} + \alpha_{10} BOOK\_MKT_{jt} + \alpha_{11} RET_{jt} + \alpha_{12} ln\_pre\_TC_{jt} + \varepsilon_{jt}.$$

Variable	Predicted Sign	Coefficient	z-statistic
Intercept	?	2.35	16.44***
FINRPT_1	+	0.06	3.86***
FINRPT_2	+	0.04	2.50**
DEV_INC	?	−0.05	−4.37***
CASH_CONSTR	?	−0.26	−1.84*
DIV_YLD	?	−3.11	−3.89***
EARN_VOL	?	1.68	3.90***
EQ_CONSTR	?	0.80	7.02***
TENURE	?	−0.00	−2.60***
LNASSET	+	0.26	17.49***
BOOK_MKT	?	−0.23	−7.43***
RET	+	0.21	8.38***
ln_pre_TC	+	0.48	18.42***
n		6,242	
Adjusted R^2		0.58	

***, **, * Significant at 1 percent, 5 percent, and 10 percent levels, respectively, using a two-tailed test.
Coefficients on yearly and industry indicator variables not reported; z-statistics calculated using Huber/White standard errors.

Variable Definitions:

ln_OPT_{jt} = natural log of value of stock options granted to CEO of firm *j* in year *t*;
ln_RSTK_{jt} = natural log of value of restricted stock granted to CEO of firm *j* in year *t*;
ln_TC_{jt} = natural log of total compensation to CEO of firm *j* in year *t*;
$FINRPT\_1_{jt}$ = factor created from principal component analysis equally weighting standardized values of *EPS_INCR*, *BEAT_FCST*, and *LEVERAGE* for firm *j* in year *t*;
EPS_INCR_{jt} = proportion of quarters on I/B/E/S, as of the end of year *t*, that firm *j* has reported increase in EPS over the same quarter in the prior year;
$BEAT\_FCST_{jt}$ = proportion of quarters on I/B/E/S, as of the end of year *t*, that firm *j* has beat analysts' EPS forecast;
$LEVERAGE_{jt}$ = (1 − debt/assets) for firm *j* in year *t* (see footnote 7);
$FINRPT\_2_{jt}$ = factor created from principal component analysis equally weighting standardized values of *ISSUE_EQ* and *ISSUE_DEBT* for firm *j* in year *t*;
$ISSUE\_EQ_{jt}$ = future increase in equity capital for firm *j* (year $t+1$) scaled by assets, 0 otherwise;
$ISSUE\_DEBT_{jt}$ = future increase in debt capital for firm *j* (year $t+1$) scaled by assets, 0 otherwise;
DEV_INC_{jt} = ln (actual incentive level/predicted incentive level) for year $t-1$, where actual incentive level is the delta of the equity portfolio and predicted incentive level is estimated from a model based on Core and Guay (1999) for the CEO in firm *j*;
$CASH\_CONSTR_{jt}$ = the three-year average over year $t-3$ to $t-1$ of [(Common and preferred dividends − cash flow from investing − cash flow from operations)/total assets] for firm *j*;
DIV_YLD_{jt} = the three-year average over year $t-3$ to $t-1$ of [dividends per share/price per share at the end of the year *t*] for firm *j*;
$EARN\_VOL_{jt}$ = the square of the standard deviation of ROA, where the standard deviation of ROA is calculated over ten years prior to year *t* for firm *j*;
EQ_CONSTR_{jt} = (executive options outstanding at the end of the year $t-1$/the three-year average over year $t-3$ to $t-1$ of percent of total options granted to executives)/total shares outstanding at the end of year $t-1$ for firm *j*;

(*continued on next page*)

TABLE 2 (continued)

$TENURE_{jt}$ = the number of years the CEO has been in that position (if missing, the number of years at the firm) in firm j as of the end of year t;
$LNASSET_{jt}$ = natural log of total assets at the end of year t for firm j;
$BOOK\_MKT_{jt}$ = book value of equity/market value of equity at the end of year t for firm j;
RET_{jt} = cumulative 12-month returns for year t for firm j;
$ln\_pre\_OPT_{jt}$ = natural log of value of stock options granted to CEO of firm j in year $t-1$;
$ln\_pre\_RSTK_{jt}$ = natural log of value of restricted stock granted to CEO of firm j in year $t-1$; and
$ln\_pre\_TC_{jt}$ = natural log of total compensation to CEO of firm j in year $t-1$.

financial reporting costs paid more option-based compensation, avoiding recognition of compensation expense.[18]

Table 2, Panel B presents the results of the regression of the natural logarithm of compensation from restricted stock on our independent variables. The relation between the use of restricted stock and *FINRPT_1* is negative and significant ($p < 0.01$), as expected, suggesting that firms with greater financial reporting concerns use less restricted stock. Unexpectedly, *FINRPT_2* is not related to the use of restricted stock. That the coefficient on *FINRPT_1* is negative and significant as expected but the coefficient on *FINRPT_2* is not related to the use of restricted stock suggests that it is firms' overall concerns about financial reporting costs (captured by *FINRPT_1*) rather than the intent to access the capital markets (captured by *FINRPT_2*) that are important in their decisions to grant restricted stock. It is also consistent with firms' compensation decisions about restricted stock being made over longer-term horizons (a stickiness in the restricted stock decision) rather than in response to the decision to access capital markets.

Larger firms and firms with better performance use more restricted stock; firms with CEO equity incentives above predicted levels use less restricted stock. Further, firms with higher dividend yields use more restricted stock, as expected. Also, the positive relation between dividend yield and restricted stock is consistent with expectations, as options are not dividend protected, while restricted stock is. There is no significant relation between cash constraints and restricted stock, similar to what we see with options. This is inconsistent with Hall and Murphy's (2002) suggestion that firms would prefer restricted stock when it is a substitute for cash compensation. Again, similar to Table 2, Panel A, the sign of the coefficient on *TENURE* is contrary to predictions, possibly because being in the job longer signals that an executive is risk-averse, so firms rely less heavily on variable compensation.

Table 2, Panel C presents the results of the regression of the natural logarithm of total compensation on our independent variables. The relation between total compensation and both *FINRPT_1* and *FINRPT_2* is positive and significant ($p < 0.01$ and $p < 0.05$, respectively). While we cannot draw definite conclusions regarding this relation from the regressions in Panel C, it is consistent with the favorable accounting treatment for stock options resulting in higher executive pay packages. We will explore this further in Section V.

---

[18] It is possible that exercisable and unexercisable options provide different performance incentives, particularly with regard to CEO turnover, and thus may affect the granting of options. While this is likely captured by the industry indicator variables, we include the proportion of options held by the CEO that are unexercisable, and our results are unchanged. We thank an anonymous reviewer for this suggestion.

Robustness Tests

We conduct several additional tests to assess the robustness of our results to alternative specifications (results untabulated). First, to mitigate possible concerns that equity grants may be influenced by managers' expectations about future prospects of the firm, we also estimate Equation (1) including future stock returns proxied by year $t+1$ cumulative 12-month stock returns, and our conclusions are unchanged.

Second, it is possible that our proxy for financial reporting concerns is correlated with prior performance and that it is prior performance, not financial reporting concerns, that leads to increases in option grants. To address this possibility, we estimate Equation (1) including first, average return on assets in years $t-3$ to $t-1$ and, alternatively, cumulative stock returns from year $t-3$ to year $t-1$ to capture prior performance. Our conclusions are unchanged.

Third, we estimate Equation (1) including as the dependent variable and prior year's compensation the proportion of total compensation from stock options and restricted stock, and our conclusions are unchanged. We also estimate Equation (1) scaling the dependent variable and prior year's compensation by sales. Our conclusions from the options and restricted stock regressions are unchanged. The results from the total compensation regression differ slightly from those in Table 2. While our conclusions on *FINRPT_2* are consistent, the coefficient on *FINRPT_1* is of the predicted sign, but not significant at conventional levels, inconsistent with the results in Table 2. However, we also estimate Equation (1) with total compensation scaled by assets as an alternative size scalar, and results are consistent with those in Table 2. Overall, our conclusions are unchanged.

Collectively, our results suggest that the favorable accounting for stock options affected equity compensation. Even after controlling for standard determinants of compensation and other factors that may influence the choice between stock options and restricted stock, concerns about reported earnings have significant explanatory power when examining the amount of compensation from options and restricted stock.

V. EXAMINATION OF CHANGES IN COMPENSATION BY FIRMS EXPENSING STOCK OPTIONS

Results from Section IV suggest that accounting played a role in firms' choice of equity compensation method. To substantiate this finding, we examine, for firms that begin to expense stock options, changes in CEO compensation from the average of the two years before expensing to the year of and year after first expensing.[19] By eliminating the financial reporting benefits of stock options, these firms no longer have the ability to avoid recording an expense with any form of equity compensation. Using this sample of firms allows us to examine the role of financial reporting concerns without having to rely on a proxy for those concerns. We interpret the results from our tests here as evidence that expensing leads to a reduced use of stock options. It should be noted, though, that an alternative possibility is that firms reduce their use of options and then decide to expense them. We investigate this possibility in "Robustness Tests and Additional Analysis" subsection.

Sample Selection

From Bear Stearns Equity Research dated December 16, 2004 (Bear Stearns & Company, Inc. 2004), we obtain a sample of 824 firms that began to expense stock options in 1995 to 2004. According to Bear Stearns, almost 50 percent of these firms have a market capitalization greater than \$1 billion, and 35 percent are international firms.[20] We focus our analysis on the 206 firms that began to expense stock options in either 2002 or 2003 and that have both ExecuComp and Compustat data in the year of their first option expensing.[21] Table 3 provides a description of those firms, as well as firms not expensing options. Thirty-two percent of firms expensing options are financial institutions, 10 percent are utilities, and 23 percent are in manufacturing industries (food, textiles, chemicals, durable manufacturers, and computers).[22]

---

[19] An alternative sample could have been firms expensing options after the effective date of SFAS No. 123(R). However, proxy data for the fiscal years subject to the new accounting rule are not yet available.

Univariate Analysis

Changes in Compensation in Firms Expensing Options

Table 4, Panel A presents univariate statistics regarding compensation levels both before and after expensing for our sample of 206 firms that expense stock options.[23] The mean (median) decrease from the period before expensing in compensation from stock options is \$1,430.2 (\$356.8) thousand in the year of first expensing and \$1,709.2 (\$589.4) thousand in the year after first expensing (all significant at $p < 0.01$). The mean (median) proportion of CEO compensation from options decreases from 46.5 percent (44.2 percent) to 38.5 percent (37.1 percent) in the year of first expensing and further to 32.4 percent (30.3 percent) in the year after first expensing (all significant at $p < 0.01$). In addition, the percent of firms granting options declines significantly ($p < 0.01$) from 88.7 percent to 68.9 percent (64.3 percent) in the year of (after) first expensing. These changes are consistent with firms shifting away from options upon deciding to expense them.

The proportion of our sample firms granting restricted stock increases significantly from 42.8 percent to 48.1 percent in the year of first expensing ($p < 0.10$) and to 55.0 percent in the year after first expensing ($p < 0.05$). In addition, the level of compensation from restricted stock in those firms rises significantly. The mean (median) increase from the period before expensing in compensation from restricted stock is \$508.8 (\$313.1) thousand in the year of first expensing and \$1,093.4 (\$969.3) thousand in the year after first expensing (all significant at either $p < 0.01$ or $p < 0.05$). In addition, the mean (median) proportion of compensation from restricted stock increases from 19.4 percent (18.6 percent) to 27.7 percent (25.2 percent) in the year of expensing and 28.9 percent (26.4 percent) in the year after expensing (all significant at $p < 0.01$). This increase may reflect a shift from options toward restricted stock in providing longer-term performance incentives, suggesting that restricted stock was previously underweighted in equity compensation. Finally, firms expensing options show no significant change in total compensation.

---

[20] Firms on the Bear Stearns list are larger and more profitable than other firms on Compustat. This is consistent with either (1) expensing firms being bigger, more profitable firms, or (2) Bear Stearns' limiting its coverage to bigger, more profitable firms. Since ExecuComp limits itself to larger, more profitable firms as well, we believe that the Bear Stearns list identifies virtually every firm on ExecuComp that expenses stock options. To the extent that it does not, it would bias against our finding results. In addition, to control for any differences in industry between the Bear Stearns firms and other firms, we include in our regression indicator variables to control for industry.

[21] We focus on 2002 and 2003 because it is in those years that a substantial number of firms began to expense options (see Table 3). We do not include firms beginning to expense options in 2004 because sufficient executive compensation data are not yet available for those firms.

[22] The relatively large proportion of expensing firms being financial institutions could reflect the August 2002 announcement by the Financial Services Forum of a list of its members that had agreed to expense options (see Schrand 2004). Accordingly, we control for industry in our multivariate analysis.

[23] Specifically, we compare the value for each variable in the year t and year $t+1$, separately, to the average value for each variable over years $t-2$ and $t-1$, where year t is the year the firm first expenses options. A firm had to award stock options and restricted stock in at least one of $t-1$ or $t-2$ to be included in the calculation for that compensation component.

TABLE 3
Comparison of 206 Firms Beginning to Expense Stock Options in 2002 or 2003 and 1,483 Firms Not Expensing Stock Options in 2002 or 2003

Panel A: Firms Beginning to Expense Stock Options By Year

Year	Number of Firms Beginning to Expense Stock Options (on Bear Stearns Report)	Number of Firms Beginning to Expense Stock Options with Data on ExecuComp and Compustat
1995	2	2
1996	2	1
1997	0	0
1998	3	1
1999	2	0
2000	2	1
2001	7	2
2002[a]	145	43
2003[a]	537	163
2004	124	20
Total	824	233

Panel B: By-Industry Comparison of 206 Firms Beginning to Expense Stock Options in 2002 or 2003 and 1,483 Firms Not Expensing Stock Options

Industry Description[b]	Number of Firms Expensing on ExecuComp and Compustat	%	Number of Firms not Expensing on ExecuComp and Compustat	%
Mining and construction	7	3	29	2
Food	4	2	37	3
Textiles, printing	16	8	82	6
Chemicals	7	4	44	3
Pharmaceuticals	1	0	55	4
Extractive industries	13	6	48	3
Durable manufacturers	15	7	333	22
Computers	3	2	114	8
Transportation	12	6	72	5
Utilities	20	10	75	5
Retail	17	8	178	12
Financial institutions	66	32	138	9
Insurance and real estate	16	8	20	1
Services	7	3	251	17
Other	2	1	7	0
Total	206	100%	1,483	100%

---

[a] In our analysis, we use the 206 firms that began to expense stock options in either 2002 or 2003 and that have both ExecuComp and Compustat data in the year of their first option expensing.

[b] Industry classifications based on Barth et al. (1998).

TABLE 4

Mean (Median) Changes in CEO Compensation for 206 Firms Beginning to Expense Stock Options in 2002 or 2003 and 1,483 Firms That Do Not Expense Stock Options

Panel A: Mean (Median) Changes in CEO Compensation for 206 Firms Beginning to Expense Stock Options in 2002 or 2003[a]

	Before Expensing	Year of Expensing	Change from Before	Year after Expensing	Change from Before
Level of compensation from options ($000)	4,704.1 (2,376.0)	3,421.4 (2,031.5)	−1,430.2*** (−356.8)***	3,135.2 (2,105.9)	−1,709.2*** (−589.4)***
Proportion of compensation from options	46.5% (44.2%)	38.5% (37.1%)	−8.5%*** (−5.8%)***	32.4% (30.3%)	−15.8%*** (−15.3%)***
% of firms granting options	88.7%	68.9%	−18.6%***	64.3%	−23.7%***
Level of compensation from restricted stock ($000)	1,790.2 (861.3)	2,434.4 (1,440.0)	508.8** (313.1)***	2,532.7 (1,679.7)	1,093.4*** (969.3)***
Proportion of compensation from restricted stock	19.4% (18.6%)	27.7% (25.2%)	7.0%*** (4.6%)***	28.9% (26.4%)	10.2%*** (7.3%)***
% of firms granting restricted stock	42.8%	48.1%	6.7%*	55.0%	12.2%**
Total compensation ($000)	7,930.3 (4,804.6)	7,104.3 (4,168.7)	−688.6* (18.9)	7,650.2 (5,026.0)	−216.7 (504.4)

(*continued on next page*)

TABLE 4 (continued)

Panel B: Mean (Median) Changes in CEO Compensation for 1,483 Firms That Do Not Expense Stock Options[b]

	Before Expensing	Year of Expensing	Change from Before	t (z)-statistic for Difference from Panel A	Year after Expensing	Change from Before	t (z)-statistic for Difference from Panel A
Level of compensation from options ($000)	3,325.7 (1,415.2)	2,701.1 (1,321.6)	−741.9*** (−37.4)***	2.14 (3.31)	2,508.6 (1,377.4)	−1,074.1*** (−99.8)***	1.36 (1.86)
Proportion of compensation from options	50.8% (50.6%)	47.9% (46.7%)	−3.6%*** (−2.8%)***	2.68 (2.82)	44.5% (42.5%)	−7.3%*** (−6.1%)***	3.62 (3.62)
% of firms granting options	88.2%	75.4%	−12.8%***	1.79	75.2%	−13.9%***	2.39
Level of compensation from restricted stock ($000)	1,137.6 (603.2)	1,575.6 (812.1)	503.2*** (89.9)***	−0.03 (−1.48)	1,661.9 (940.5)	527.9*** (164.5)***	−2.34 (−2.92)
Proportion of compensation from restricted stock	18.4% (16.2%)	24.0% (21.4%)	5.0%*** (3.7%)***	−0.98 (−0.68)	24.5% (22.4%)	5.7%*** (4.5%)***	−1.85 (−1.73)
% of firms granting restricted stock	27.2%	24.7%	−2.4%***	−2.80	30.5%	3.1%***	−2.07
Total compensation ($000)	4,876.3 (2,579.1)	4,366.6 (2,363.6)	−608.9*** (−38.0)***	0.21 (−0.57)	4,751.4 (2,722.3)	−577.9*** (26.4)	−0.71 (−2.40)

*** ,**,* Significant at 1 percent, 5 percent, and 10 percent, respectively, using t-test of difference in means (Mann-Whitney rank sum test of difference in medians).

[a] To mitigate the influence of outliers, we winsorize the continuous variables at 1 percent and 99 percent. The "Before Expensing" column is calculated as the average value for each variable over years $t-2$ and $t-1$, where year t is the year the firm first expenses options. The level and percent of compensation from options/restricted stock (and respective changes in) are calculated only for firms that grant options/restricted stock in that period.

[b] To mitigate the influence of outliers, we winsorize the continuous variables at 1 percent and 99 percent. The "Before Expensing" column is calculated as the average of 2000 and 2001 and the average of 2001 and 2002; the "Year of Expensing" is 2002 and 2003; the "Year after Expensing" is 2003 and 2004. The level and percent of compensation from options/restricted stock (and respective changes in) are calculated only for firms that grant options/restricted stock in that period.

Comparison to Changes in Compensation in Firms Not Expensing Options

The changes in CEO compensation in our sample of firms expensing options can stem from these firms' decisions to expense options or from changes in other economic factors that affect compensation. To control for macroeconomic factors, we compare the changes in CEO compensation in our sample to changes in CEO compensation over the same time period in a sample of firms not expensing options. That sample comprises 1,483 firms included on both ExecuComp and Compustat but not included on the Bear Stearns list.

Table 4, Panel B presents univariate statistics regarding changes in compensation for our control sample of 1,483 firms not expensing options. Control firms also decrease compensation from options and the proportion of compensation from options, and there is a decline in the proportion of control firms granting options over the study period.[24] However, these changes are significantly smaller than changes exhibited by firms expensing options.

Control firms increase pay from restricted stock, but this increase is significantly lower than that by expensing firms (the mean [median] increase in compensation from restricted stock is significantly lower than that for expensing firms in the year after, at $p < 0.05$ [$p < 0.01$]).[25] In addition, the proportion of control firms granting restricted stock *decreased* from 27.2 percent to 24.7 percent in the year of expensing, compared to an *increase* among the sample firms ($p < 0.10$), although that proportion does increase in the year after. In total, these differences offer significant evidence of a shift by firms toward using restricted stock upon deciding to expense options.

The change in total compensation for expensing firms is not significant at conventional levels (with the exception of the mean decrease in the year of expensing, which is significant at only $p < 0.10$). Other than the median increase in the year after first expensing, there is no difference between expensing and control firms in changes in total compensation. Combined with results related to stock options and restricted stock, these results are consistent with firms shifting from stock options to restricted stock and maintaining pre-expensing compensation levels.

Multivariate Analysis

In this section, we examine whether our inferences drawn from Table 4 hold after controlling for both general economic trends and other factors that affect compensation. We estimate the following regression for the year of and year after first expensing:[26]

$$\begin{aligned} DEP\_VBL_{jt} = {} & \alpha_0 + \alpha_1 EXPENSER_{jt} + \alpha_2 DEV\_INC_{jt} + \alpha_3 CASH\_CONSTR_{jt} \\ & + \alpha_4 DIV\_YLD_{jt} + \alpha_5 EARN\_VOL_{jt} + \alpha_6 EQ\_CONSTR_{jt} \\ & + \alpha_7 TENURE_{jt} + \alpha_8 LNASSET_{jt} + \alpha_9 BOOK\_MKT_{jt} + \alpha_{10} RET_{jt} \\ & + \alpha_{11} ln\_pre\_DEP\_VBL_{jt} + \varepsilon_{jt} \qquad (2) \end{aligned}$$

---

[24] The decrease in reliance on options by non-expensing firms may reflect an expectation on behalf of these firms that option expensing will become mandatory and, as a result, a move to decrease reliance on options.

[25] It is important to note that we *understate* the increase in pay from restricted stock for our sample firms since our calculation requires firms to be granting restricted stock in years $t-2$ or $t-1$ and sample firms have a significant increase in the number of firms granting restricted stock in year t. Use of restricted stock in firms that begin granting in year t is excluded from our calculations. This understatement does not apply to control firms since there is a decline in the number of firms granting restricted stock.

[26] To mitigate the influence of outlying observations, we winsorize the current and lagged values of the dependent variables and values of *DEV_INC, CASH_CONSTR, DIV_YLD, EARN_VOL, EQ_CONSTR, TENURE, BOOK_MKT,* and *RET* that are below (above) the 1st (99th) percentile. Because of censoring in the equity grant data, we estimate Equation (2) using Tobit when ln_*OPT* and ln_*RSTK* are the dependent variables.

where:

Dependent variables:

ln_OPT_{jt} = natural log of value of stock options granted to CEO for firm j in year t or $t+1$;

ln_RSTK_{jt} = natural log of value of restricted stock granted to CEO for firm j in year t or $t+1$; and

ln_TC_{jt} = natural log of total compensation for CEO for firm j in year t or $t+1$.

Independent variables:

$EXPENSER_j$ = 1 if firm j expenses options in 2002 or 2003, 0 otherwise;

$ln\_pre\_OPT_{jt}$ = natural log of average value of stock options granted to CEO for firm j in years $t-2$ and $t-1$;

$ln\_pre\_RSTK_{jt}$ = natural log of average value of restricted stock granted to CEO for firm j in years $t-2$ and $t-1$; and

$ln\_pre\_TC_{jt}$ = natural log of average total compensation for CEO for firm j in years $t-2$ and $t-1$.

All other variables are as defined in Section IV.

We include industry indicator variables in each regression and estimate significance using Huber/White standard errors to adjust for any potential heteroscedasticity and serial correlation in the data.

The coefficient on *EXPENSER* captures the differences in the dependent variable between firms expensing options and firms not expensing options, after controlling for other factors. If firms shift away from stock options after expensing options, then we would expect a negative relation between compensation from stock options and *EXPENSER*. A positive relation between compensation from restricted stock and *EXPENSER* would suggest that firms shift into restricted stock once they begin expensing options and would be consistent with firms having substituted options for restricted stock prior to expensing options. A negative relation between *EXPENSER* and total compensation would suggest that favorable accounting treatment for stock options in a pre-expensing regime led to higher levels of overall compensation and that expensing firms are adjusting compensation downward. While no relation between *EXPENSER* and total compensation would be consistent with the favorable accounting treatment from options having no effect on overall levels of executive compensation, it is also consistent with it having led to higher levels but firms finding it difficult to downsize executive pay packages.

Results

Table 5, Panels A, B, and C present the results of estimating Equation (2). These results confirm inferences drawn from the univariate statistics in Table 4. Specifically, upon expensing options, firms pay less option compensation to CEOs (the coefficient on *EXPENSER* in Panel A is negative and significant at $p < 0.01$). These firms increase their use of restricted stock significantly more than do firms not expensing options (the coefficient on *EXPENSER* in Panel B is positive and significant at $p < 0.01$). The shift away from stock options upon expensing them confirms that accounting mattered in the decision to grant options. That the shift into restricted stock accompanies the shift away from options is consistent with an underweighting of restricted stock in CEOs' pay packages under the

TABLE 5
Regressions of the Level of CEO Stock Options, Restricted Stock, and Total Compensation in the Year of and Year after First Expensing on an Indicator of the Expensing Decision and Other Factors

Panel A: Natural Logarithm of CEO Compensation from Stock Options

$$ln\_OPT_{jt} = \alpha_0 + \alpha_1 EXPENSER_j + \alpha_2 DEV\_INC_{jt} + \alpha_3 CASH\_CONSTR_{jt} + \alpha_4 DIV\_YLD_{jt} + \alpha_5 EARN\_VOL_{jt} + \alpha_6 EQ\_CONSTR_{jt} + \alpha_7 TENURE_{jt} + \alpha_8 LNASSET_{jt} + \alpha_9 BOOK\_MKT_{jt} + \alpha_{10} RET_{jt} + \alpha_{11} ln\_pre\_OPT_{jt} + \varepsilon_{jt}.$$

Variable	Predicted Sign	Coefficient	t-statistic
Intercept	?	0.34	0.47
EXPENSER	−	−1.17	−3.15***
DEV_INC	−	−0.15	−1.69*
CASH_CONSTR	+	0.12	0.11
DIV_YLD	−	−19.00	−2.64***
EARN_VOL	?	−2.71	−1.07
EQ_CONSTR	−	2.58	4.29***
TENURE	+	−0.06	−4.40***
LNASSET	+	0.54	8.48***
BOOK_MKT	−	−1.13	−4.47***
RET	+	−0.23	−1.59
ln_pre_OPT	+	0.29	10.81***
n		4,017	
Wald χ^2 statistic (p-value)		482.68 (0.00)	

Panel B: Natural Logarithm of CEO Compensation from Restricted Stock

$$ln\_RSTK_{jt} = \alpha_0 + \alpha_1 EXPENSER_j + \alpha_2 DEV\_INC_{jt} + \alpha_3 CASH\_CONSTR_{jt} + \alpha_4 DIV\_YLD_{jt} + \alpha_5 EARN\_VOL_{jt} + \alpha_6 EQ\_CONSTR_{jt} + \alpha_7 TENURE_{jt} + \alpha_8 LNASSET_{jt} + \alpha_9 BOOK\_MKT_{jt} + \alpha_{10} RET_{jt} + \alpha_{11} ln\_pre\_RSTK_{jt} + \varepsilon_{jt}.$$

Variable	Predicted Sign	Coefficient	t-statistic
Intercept	?	−6.03	−3.58***
EXPENSER	+	1.98	2.81***
DEV_INC	−	−0.15	−0.78
CASH_CONSTR	+	−0.36	−0.12
DIV_YLD	+	38.80	2.51***
EARN_VOL	?	−2.10	−0.30
EQ_CONSTR	−	−2.04	−1.31
TENURE	+	−0.14	−3.99***
LNASSET	+	0.70	4.71***
BOOK_MKT	−	−0.55	−0.99
RET	+	0.17	0.45
ln_pre_RSTK	+	0.56	20.16***
n		4,017	
Wald χ^2 statistic (p-value)		947.15 (0.00)	

(*continued on next page*)

TABLE 5 (continued)

Panel C: Natural Logarithm of Total CEO Compensation

$$ln\_TC_{jt} = \alpha_0 + \alpha_1 EXPENSER_j + \alpha_2 DEV\_INC_{jt} + \alpha_3 CASH\_CONSTR_{jt} + \alpha_4 DIV\_YLD_{jt} + \alpha_5 EARN\_VOL_{jt} + \alpha_6 EQ\_CONSTR_{jt} + \alpha_7 TENURE_{jt} + \alpha_8 LNASSET_{jt} + \alpha_9 BOOK\_MKT_{jt} + \alpha_{10} RET_{jt} + \alpha_{11} ln\_pre\_TC_{jt} + \varepsilon_{jt}.$$

Variable	**Predicted Sign**	**Coefficient**	**t-statistic**
Intercept	?	2.17	6.14***
EXPENSER	0 or −	0.04	0.87
DEV_INC	?	−0.07	−2.05**
CASH_CONSTR	?	−0.79	−1.84*
DIV_YLD	?	0.16	0.08
EARN_VOL	?	−0.85	−1.15
EQ_CONSTR	?	0.45	3.08***
TENURE	?	−0.00	−0.66
LNASSET	+	0.20	4.87***
BOOK_MKT	?	−0.34	−2.60***
RET	+	0.04	1.10
ln_pre_TC	+	0.55	7.63***
n		4,016	
Adj. R^2		0.50	

***, **, * Significant at 1 percent, 5 percent, and 10 percent levels, respectively, using a two-tailed test.
Coefficients on industry indicator variables not reported; t-statistics calculated using Huber/White standard errors.

Variable Definitions:

ln_OPT_{jt} = natural log of value of stock options granted to CEO for firm *j* in year *t* or *t*+1;
ln_RSTK_{jt} = natural log of value of restricted stock granted to CEO for firm *j* in year *t* or *t*+1;
ln_TC_{jt} = natural log of total compensation to CEO for firm *j* in year *t* or *t*+1;
$EXPENSER_j$ = 1 if firm *j* expenses options in 2002 or 2003, 0 otherwise;
DEV_INC_{jt} = ln (actual incentive level/predicted incentive level) at the beginning of year *t* for firm *j*, where actual incentive level is the delta of the equity portfolio and predicted incentive level is estimated from a model based on Core and Guay (1999) for the CEO in firm *j*;
$CASH\_CONSTR_{jt}$ = the three-year average over year *t*−3 to *t*−1 of [(Common and preferred dividends − cash flow from investing − cash flow from operations)/total assets] for firm *j*;
DIV_YLD_{jt} = the three-year average over year *t*−3 to *t*−1 of [dividends per share/price per share at the end of the year *t*];
$EARN\_VOL_{jt}$ = the square of the standard deviation of ROA, where the standard deviation of ROA is calculated over ten years prior to year *t* for firm *j*;
EQ_CONSTR_{jt} = (executive options outstanding at the end of the year *t*−1/the three-year average over year *t*−3 to *t*−1 of percent of total options granted to executives)/total shares outstanding at the end of year *t*−1 for firm *j*;
$TENURE_{jt}$ = the number of years the CEO has been in that position (if missing, the number of years at the firm) in firm *j* as of the end of year *t*;
$LNASSET_{jt}$ = natural log of total assets at the end of year *t* for firm *j*;
$BOOK\_MKT_{jt}$ = book value of equity/market value of equity at the end of year *t* for firm *j*;
RET_{jt} = cumulative 12-month returns for year *t* for firm *j*;
$ln\_pre\_OPT_{jt}$ = natural log of average value of stock options granted to CEO of firm *j* in years *t*−2 and *t*−1;
$ln\_pre\_RSTK_{jt}$ = natural log of average value of restricted stock granted to CEO of firm *j* in years *t*−2 and *t*−1; and
$ln\_pre\_TC_{jt}$ = natural log of average total compensation to CEO of firm *j* in years *t*−2 and *t*−1.

previous regime.[27] Our results suggest that firms likely have been willing to forgo some benefits of restricted stock, such as those discussed in Section II, to get the favorable accounting treatment of stock options.

We find no evidence of a change in total compensation (the coefficient on *EXPENSER* in Table 5, Panel C is not significant at conventional levels). In combination with results from Section IV, this result is consistent with the favorable accounting treatment for options leading to higher levels of overall compensation and firms now finding it difficult to downsize executive pay packages.[28]

Robustness Tests and Additional Analysis

We conduct several tests to assess the robustness of our results to alternative specifications. First, we estimate Equation (2) including as the dependent variable the change in compensation from stock options, restricted stock, and total compensation from the two years before to the year of and year after first expensing.[29] The coefficient on *EXPENSER* in our options regression is negative and significant at $p < 0.05$. The coefficient on *EXPENSER* in our restricted stock regression is positive and significant at $p < 0.05$. The coefficient on *EXPENSER* in our total compensation regression is positive and significant at $p < 0.05$. Accordingly, our conclusions that firms shift away from options and into restricted stock and that expensing does not result in a decrease in total compensation are unchanged.

Second, we estimate Equation (2) including as the dependent variable and prior year's compensation the proportion of total compensation from stock options and restricted stock, and our conclusions are unchanged. We also estimate Equation (2) scaling the dependent variable (options, restricted stock, and total compensation) and prior year's compensation by sales, and our conclusions are unchanged.

Finally, the voluntary nature of the expensing decision presents some challenges in interpreting our results in this section. Specifically, it is possible that firms' choices about expensing result in a selection bias that impacts our conclusions regarding a reduction in options and an increase in restricted stock upon expensing options. We consider the use of an instrumental variables approach to address this potential issue. However, concerns about the instrumental variables approach raised by Larcker and Rusticus (2005) seem to apply to our study. Specifically, we model the decision to expense options in the first stage using Equation (1) in Aboody et al. (2004a). Our logit estimation has a Pseudo R^2 of 0.20. We then consider whether this model provides good instruments for our second stage analysis, as suggested in Larcker and Rusticus (2005). First, we obtain the residuals from the second stage regressions of each of our dependent variables and regress them on all exogenous variables. An indication of good instruments would be coefficients on the instruments that are close to zero. However, our tests indicate that they are statistically different from zero. We also examine the "unconstrained" second stage. Like Larcker and Rusticus (2005), we replace the first stage variables with the product of the coefficient from the first stage and the variable's original value. An indication of valid instruments would be coefficients on the instruments that do not differ much from each other. However, tests indicate that they differ from zero and are of different signs. Thus, depending on which instrument one would choose, we could get either a positive or a negative effect of expensing on future stock option compensation. We conclude from this analysis that our instruments are not of good quality, suggesting that 2SLS in our context likely does not provide better estimates than does OLS. Therefore, we rely on our results reported in Table 5.

---

[27] We also estimate Equation (2) with the natural log of salary and the natural log of bonus as dependent variables (results not tabulated). We find no evidence of an increase in the use of salary or bonus upon expensing options. These statistics provide no evidence that the shift away from options after expensing is accompanied by an increased reliance on cash compensation.

[28] We thank an anonymous reviewer for suggesting that possible concurrent changes in the corporate governance environment may be contributing to our findings. To explore this possibility, we examine one aspect of corporate governance, whether there are differences in the independence of the compensation committee (given that we looking at executive compensation) between firms that expense and firms that do not expense both before and after 2002. We find no difference in the mean or median percent of independent directors on the compensation committee between expensers and firms not expensing options either before or after 2002. This suggests that changes in the independence of the compensation committee are not affecting the decision to alter compensation in response to expensing options.

[29] In this specification, we exclude from our independent variables the prior year's compensation. We also exclude *TENURE* because in a changes specification, all observations have a value of 1 for this variable.

Our inability to control for the voluntary nature of the decision to expense raises the possibility of an alternative explanation for our results—rather than firms deciding to expense options and as a result to decrease their use, it is possible that firms first decide to decrease the use of options and as a result decide to expense them. To investigate this potential alternative explanation, we do two things. First, we examine the use of options by expensing firms before the decision to expense them. Our data reveal no decline in the proportion of firms granting options in the years before expensing them. In fact, the data suggest the opposite for our sample of firms expensing options—the proportion of these firms that granted options increased steadily prior to expensing: 77.4 percent in 1998; 79.7 percent in 1999; 83.5 percent in 2000; and 85.1 percent in 2001. Second, we examine proxy statements for our sample of firms that expense options for any mention of changes to their equity compensation plans. We obtain proxy statements for the 206 expensing firms in our sample for the year in which they begin to expense options. Of the 206 firms, 70 (34 percent) indicate they are making changes to their equity compensation plans (including 13 firms that are decreasing their use of options, 13 firms that are increasing their use of restricted stock, and 32 that are doing both). Eleven (16 percent) of these 70 firms indicate that these changes resulted from their decision to expense stock options.[30] We interpret these data as further support that the previously available accounting treatment for options has played a role in equity compensation and that firms decrease the use of options upon deciding to expense them. However, this interpretation is subject to the caveat that we may not have completely ruled out the alternative explanation.

VI. CONCLUSION

We provide evidence that accounting does affect equity compensation using a sample of ExecuComp firms and data from 1995 to 2001. Our proxy for firms' concerns about financial reporting costs is positively related to the use of stock options and negatively related to the use of restricted stock, consistent with the favorable treatment for stock options having led to an overweighting of options and an underweighting of restricted stock in CEO compensation packages. In addition, we find that our proxy for financial reporting concerns is positively related to total compensation, consistent with the formerly favorable accounting treatment for stock options possibly leading to higher overall CEO pay.

As further tests of the role of accounting in equity compensation, we examine whether firms that expense stock options alter CEO equity compensation packages in response to the decision to expense options. Using a sample of firms that began to expense stock options in 2002 and 2003, we examine changes in the structure of CEO pay packages concurrent with and after the decision to expense options. By eliminating the financial reporting benefit of stock options, firms expensing stock options no longer have an ability to avoid recording expenses with any form of equity compensation. Using this sample, we are able to test our hypotheses without having to rely on a proxy for firms' financial reporting concerns.

---

[30] Other reasons firms provide include the desire to retain executives and avoid dilution from stock options.

Our findings confirm the role of accounting in equity compensation design. We find that firms expensing options decrease compensation from options and increase compensation from restricted stock, even after controlling for standard economic determinants of compensation and general economic trends. However, our results are subject to the caveat that we may not have fully ruled out the alternative explanation that firms decreased the use of options and then decided to expense them. We find no evidence of a decrease in total compensation, possibly suggesting that the favorable accounting treatment for stock options did not lead to higher levels of executive compensation. However, in combination with the positive association between financial reporting concerns and total CEO compensation in the pre-expensing period, this result suggests that firms find it difficult to downsize the large executive pay packages that resulted from the favorable accounting treatment for stock options.

That firms expensing stock options are granting fewer options and more restricted stock suggests that firms shift toward restricted stock to provide longer-term performance incentives and that there will likely be changes in CEO compensation now that SFAS No. 123(R) is in effect. Though firms may have appeared to favor options, under a regime of mandatory expensing, the role of options in executive compensation may be restricted. Overall, our results support the assertion that accounting plays a role in executive compensation plan design.

REFERENCES

Abarbanell, J., and R. Lehavy. 2003. Can stock recommendations predict earnings management and analyst forecast errors? *Journal of Accounting Research* 41 (March): 1–31.

Aboody, D., M. Barth, and R. Kasznik. 2004a. Firms' voluntary recognition of stock-based compensation expense. *Journal of Accounting Research* 42 (May): 123–150.

———, ———, and ———. 2004b. SFAS No. 123 stock-based compensation expense and equity market values. *The Accounting Review* 79 (April): 251–275.

Allgood, S., and K. Farrell. 2000. The impact of tenure on the firm performance-CEO-turnover relation. *Journal of Financial Research* 23 (Fall): 373–390.

———, and ———. 2003. The match between CEO and firm. *Journal of Business* 76 (April): 317–341.

Anderson, S., J. Cavanagh, C. Hartman, S. Klinger, and H. Sklar. 2002. *Excessive Excess 2002.* Washington, D.C.: Institute for Policy Studies.

Anthony, J. H., B. Bettinghaus, and D. B. Farber. 2004. Earnings management and the market response to convertible debt issuance. Working paper, Michigan State University, East Lansing, MI.

Barth, M., W. Beaver, and W. Landsman. 1998. Relative valuation roles of equity book value and net income as a function of financial health. *Journal of Accounting and Economics* 25 (February): 1–34.

———, J. Elliot, and M. Finn. 1999. Market rewards associated with patterns of increasing earnings. *Journal of Accounting Research* 37 (Autumn): 387–413.

Bartov, E., D. Givoly, and C. Hayn. 2002. The rewards to meeting or beating earnings expectations. *Journal of Accounting and Economics* 33 (June): 173–204.

Bear Stearns & Company, Inc. 2004. *FASB Does It: FAS 123(R) Requires Stock Option Expensing.* December 16. New York, NY: Bear Stearns.

———. 2006. *Employee Stock Options: 749 Companies Accelerate Stock Options' Vesting.* January 6. New York, NY: Bear Stearns.

Botosan, C., and M. Plumlee. 2001. Stock options expense: The sword of Damocles revealed. *Accounting Horizons* 15 (December): 311–327.

Bryan, S., L. Hwang, and S. Lilien. 2000. CEO stock-based compensation: An empirical analysis of incentive-intensity, relative mix, and economic determinants. *Journal of Business* 73 (October): 661–693.

Burgstahler, D., and I. Dichev. 1997. Earnings management to avoid earnings decreases and losses. *Journal of Accounting and Economics* 24 (December): 99–126.

———, and M. Eames. 1999. Management of earnings and analyst forecasts. Working paper, University of Washington, Seattle, WA.

Carter, M. E., and L. J. Lynch. 2003. The consequences of the FASB's 1998 proposal on accounting for stock option repricing. *Journal of Accounting and Economics* 35 (April): 51–72.

———, and ———. 2005. Agency issues in compensation contract design: Evidence from the change in accounting for stock option repricings. Working paper, University of Pennsylvania, Philadelphia, PA.

Choudary, P., S. Rajgopal, and M. Venkatachalam. 2006. Accelerated vesting of employee stock options in anticipation of FAS 123-R. Working paper, Duke University, Durham, NC.

Core, J., and W. Guay. 1999. The use of equity grants to manage optimal incentive levels. *Journal of Accounting and Economics* 28 (December): 151–184.

———, and ———. 2001. Stock option plans for non-executive employees. *Journal of Financial Economics* 61 (August): 253–287.

———, ———, and D. Larcker. 2003. Executive equity compensation and incentives: A survey. *Economic Policy Review* (April).

Dechow, P., A. Hutton, and R. Sloan. 1996. The economic consequences of accounting for stock-based compensation. *Journal of Accounting Research* 34 (Supplement): 1–20.

DeFond, M. L., and J. Jiambalvo. 1994. Debt covenant violation and manipulation of accruals. *Journal of Accounting and Economics* 17 (January): 145–176.

Degeorge, F., J. Patel, and R. Zeckhauser. 1999. Earnings management to exceed thresholds. *Journal of Business* 72 (January): 1–33.

Dichev, I. D., and D. J. Skinner. 2002. Large-sample evidence on the debt covenant hypothesis. *Journal of Accounting Research* 40 (September): 1091–1123.

Doubleday, D., and S. Fujii. 2001. Weighing your options, equity strategies in a volatile market. *WorldatWork Journal* (Second Quarter).

Espahbodi, H., P. Espahbodi, A. Rezaee, and H. Tehranian. 2002. Stock price reaction and value relevance of recognition versus disclosure: The case of stock-based compensation. *Journal of Accounting and Economics* 33 (August): 343–373.

Farber, H. S. 1999. Mobility and stability: The dynamics of job change in labor markets. In *Handbook of Labor Economics*, Vol. 3, edited by O. Ashenfelter, and D. Card. New York, NY: Elsevier Science.

Feltham, G., and M. Wu. 2001. Incentive efficiency of stock versus options. *Review of Accounting Studies* 6 (March): 7–28.

Financial Accounting Standards Board (FASB). 1995. *Accounting for Stock-Based Compensation.* Statement of Financial Accounting Standards No. 123. Norwalk, CT: FASB.

———. 2004. *Share-Based Payment.* Statement of Financial Accounting Standards No. 123(R). Norwalk, CT: FASB.

Gaver, J., and K. Gaver. 1993. Additional evidence on the association between the investment opportunity set and corporate financing, dividend, and compensation policies. *Journal of Accounting and Economics* 16 (January–July): 125–160.

Hall, B., and K. Murphy. 2002. Stock options for undiversified executives. *Journal of Accounting and Economics* 33 (February): 3–42.

Hand, J. 1990. A test of the extended functional fixation hypothesis. *The Accounting Review* 65 (October): 740–763.

Kasznik, R., and M. McNichols. 2002. Does meeting earnings expectations matter? Evidence from analyst forecast revisions and share prices. *Journal of Accounting Research* 40 (June): 727–759.

Kimbrough, M., and H. Louis. 2004. Financial reporting incentives, corporate governance, and the trade-off among alternative forms of executive compensation. Working paper, Harvard University, Boston, MA.

Kole, S. 1997. The complexity of compensation contracts. *Journal of Financial Economics* 43 (January): 79–104.

Lambert, R., and D. Larcker. 2004. Stock options, restricted stock, and incentives. Working paper, University of Pennsylvania, Philadelphia, PA.

Larcker, D., and T. Rusticus. 2005. On the use of instrumental variables in accounting research. Working paper, Stanford University, Stanford, CA.

Matsunaga, S. 1995. The effect of financial reporting costs on the use of employee stock options. *The Accounting Review* 70 (January): 1–26.

Murphy, K. 1985. Corporate performance and managerial remuneration. *Journal of Accounting and Economics* 7 (April): 11–42.

Oyer, P., and S. Schaefer. 2005. Why do some firms give stock options to all employees? An empirical examination of alternative theories. *Journal of Financial Economics* 76 (April): 99–133.

———, and ———. 2006. Costs of broad-based stock option plans. *Journal of Financial Intermediation* 15 (4): 511–534.

Richardson, S., S. H. Teoh, and P. Wysocki. 2004. The walk-down to beatable analysts' forecasts: The role of equity issuance and insider trading incentives. *Contemporary Accounting Research* 21 (December): 885–924.

Ryan, H., and R. Wiggins. 2001. The influence of firm- and manager-specific characteristics on the structure of executive compensation. *Journal of Corporate Finance* 7 (June): 101–123.

Sebora, T. C. 1996. CEO-board relationship evaluation: An exploratory investigation of the influence of base rate factors. *Journal of Managerial Issues* 8 (Spring): 54–77.

Schrand, C. 2004. Discussion of firms' voluntary recognition of stock-based compensation expense. *Journal of Accounting Research* 42 (May): 151–158.

Smith, C., and R. Watts. 1992. The investment opportunity set and corporate financing, dividend, and compensation policies. *Journal of Financial Economics* 32 (December): 263–292.

Sweeney, A. 1994. Debt covenant violations and managers' accounting responses. *Journal of Accounting and Economics* 17 (May): 281–308.

Teoh, S. H., and T. J. Wong. 1998. Earnings management and the long-run market performance of initial public offerings. *Journal of Finance* 53 (December): 1935–1974.

———, I. Welch, and T. J. Wong. 1998. Earnings management and the underperformance of seasoned equity offerings. *Journal of Financial Economics* 50 (October): 63–99.

Watts, R., and J. Zimmerman. 1986. *Positive Accounting Theory*. Englewood Cliffs, NJ: Prentice Hall.

———, and ———. 1990. Positive accounting theory: A ten-year perspective. *The Accounting Review* 65 (January): 131–56.

Yermack, D. 1995. Do corporations award CEO stock options effectively? *Journal of Financial Economics* 39 (October–November): 237–269.

THE ACCOUNTING REVIEW
Vol. 82, No. 2
2007
pp. 359–387

Tax Benefits as a Source of Merger Premiums In Acquisitions of Private Corporations

Merle M. Erickson
University of Chicago

Shiing-wu Wang
University of Southern California

ABSTRACT: Scholes et al. (2005) predict that S corporations, and other conduit entities such as partnerships and LLCs, can sell for a tax-driven purchase price premium relative to C corporations. We test this conjecture by comparing purchase price multiples in a sample of taxable stock acquisitions of S corporations to purchase price multiples for a matched set of taxable stock acquisitions of privately held C corporations. Consistent with Scholes et al.'s (2005) predictions, we find evidence that the organizational form of the target influences acquisition tax structure and acquisition price. Specifically, the evidence supports the conclusion that conduit entities (S corporations) fetch a tax-based purchase price premium relative to similar C corporations. Furthermore, our estimates indicate that average tax benefits in S corporation acquisitions are equal to approximately 12–17 percent of deal value.

Keywords: *taxes; tax benefits; mergers; acquisitions.*

Data Availability: *Most data were obtained from SEC filings, but some data were obtained from confidential sources.*

JEL Classifications: *H25; G34.*

We appreciate comments and suggestions of M. Hanlon, S. Kaplan, E. Maydew, and E. Outslay. We also appreciate the assistance of Jon Ackerman (UBS), Sara Andersen (Coca-Cola Enterprises), Matt Daly (Kleinheinz Capital Partners), Matt Friedman, Jacob Grossman, Chad Holm (Citicorp Global Markets), Doug Lawson (US Bancorp-Piper Jaffray), Max Mazzone (Credit Suisse/First Boston), Neil Monroe (Coca-Cola Enterprises), Jim Moskal, Kirsten Simpson (Ernst & Young), Erik Swanson (Ernst & Young), Don Wiggins (Heritage Capital), and members of the Chicago Private Equity Network. We appreciate the research assistance of Dustin Gonzalez and Taorong Jiang. Professor Erickson acknowledges the financial support of the Graduate School of Business at the University of Chicago. Professor Wang acknowledges the financial support of the Marshall School of Business at the University of Southern California.

Editor's note: This paper was accepted by Dan Dhaliwal.

Submitted January 2006
Accepted August 2006

I. INTRODUCTION

We investigate how a target's organizational form influences an acquisition's tax structure, and how organizational form-driven acquisition structuring differences influence purchase prices.[1] We first model the effect of organizational form (C corporations and conduit entities) on the choice of transaction structure. We use S corporations to represent conduit entities, rather than partnerships or LLCs, because they are similar to C corporations along many nontax dimensions, but are different along tax dimensions. The model shows that the acquisition of an S corporation is typically completed using a tax structure that results in a step-up in the tax basis of the target's assets. This step-up in tax basis is chosen because the value of incremental depreciation and amortization deductions resulting from the step-up, which generates tax savings and increases acquirer cash flow, is greater than the immediate tax liability on the gain from the step-up. Since acquiring firms are unable to obtain these tax benefits without the explicit cooperation of selling firm shareholders, they should be willing to pay target shareholders, in the form of a higher purchase price, to cooperate in the deal's tax structuring. For example, when Coca-Cola Enterprises acquired Herb Coca-Cola in May 2001, Coca-Cola Enterprises paid the shareholders of Herb Coca-Cola a $100 million premium to obtain this beneficial tax structure.[2]

On the other hand, our analysis shows that such a step-up tax structure is typically not viable in the acquisition of a C corporation because the tax costs of the step-up exceed the tax benefits. This result is in contrast to the view that a step-up structure normally prevails in acquisitions due to the tax benefits from the step-up. It also shows that the optimal tax structure in the acquisition of a C corporation is different from the optimal structure in an S corporation acquisition. This part of the analysis indicates that the organizational form of the target affects an acquisition's tax structure.

After illustrating the effect of organizational form on acquisition tax structure, we demonstrate that differences in acquisition tax structure can result in differences in purchase prices. The analysis suggests that an S corporation can be sold for a higher price than a C corporation with identical tax attributes and cash flows. For this reason, we hypothesize that S corporations can fetch a tax-based purchase price premium relative to similar C corporations.

To empirically test this hypothesis, we analyze 77 matched pairs of taxable stock acquisitions of S corporations and C corporations completed during the period 1994 through 2000. As predicted, we find that the target's organizational form does influence the acquisition's tax structure. Specifically, all sample S corporation acquisitions are structured in a manner that steps up the tax basis of the target's assets, while none of the sample C corporation acquisitions result in a step-up. Because all of our sample firms (S and C corporations) are privately held, we compare purchase price multiples (e.g., price to EBITDA) across target organizational form to determine if acquisition prices vary by target firm organizational form. We find that purchase price multiples are generally higher in the S corporation acquisitions than in the matched sample of C corporation acquisitions. We estimate the tax benefits in the S corporation acquisitions and find that on average, these benefits equal 12–17 percent of the deal's value. In our sample of S corporation acquisitions, the aggregate present value of tax savings generated is about $700 million. Finally, we present several pieces of anecdotal evidence that support the conclusion that S corporations often fetch a tax-based purchase price premium relative to similar C corporations.[3] We interpret the body of evidence as supporting the conclusion that a target's organizational form affects the tax structure of the acquisition and that such structuring differences lead to differences in acquisition prices.

---

[1] Prior related research includes: Shackelford (1991), Guenther (1994), Landsman and Shackelford (1995), Erickson and Maydew (1998), Engel et al. (1999), Erickson (1998), Erickson and Wang (1999, 2000), Lang and Shackelford (2000), Maydew et al. (1999), Ayers et al. (2003), and Dhaliwal et al. (2004).

[2] Sources: Coca-Cola Enterprises 8-K filed July 11, 2001; and conversations with Neil Monroe and Sara Andersen at Coca-Cola Enterprises. As discussed later, in other transactions about which we are familiar, the seller did not obtain any premium for the tax benefits associated with the sale of the S corporation due to seller ignorance.

This study makes several contributions. Most broadly, it contributes to the taxes and asset-pricing literature. To our knowledge, this is the first study that provides evidence that the purchase price of a business systematically varies as a function of the organizational form of that entity. Current valuation literature (e.g., Palepu et al. 2000) is silent on the impact of organizational form on fair market values—the price at which assets change hands between willing sellers and buyers. This study also contributes to the growing literature that analyzes how taxes influence transaction structure (e.g., Erickson 1998; Maydew et al. 1999; Erickson and Wang 2000). Specifically, we show that the target's organizational form influences acquisition structure.

Furthermore, there is an extensive body of literature in corporate finance (e.g., Asquith et al. 1983) that investigates the determinants of merger premia (e.g., form of consideration, deal attitude). There is also literature (e.g., Kaplan 1989; Erickson and Wang 2000) that analyzes the effects of tax benefits on acquisition premia. Neither of these streams of research has investigated if and how a target's organizational form affects merger premia. For that reason, this study presents an initial investigation of that issue.

With the recent interest in venture capital transactions, the analyses in this paper are particularly important because many new ventures are operated through conduit-type organizational forms, such as LLCs, and not through traditional C corporations. Furthermore, one study indicates that approximately 90 percent of successful new ventures are acquired before becoming public companies (see Anders 1999). Given that the majority of successful new ventures are acquired, understanding how organizational form affects exit strategy cash flows is important in its own right. Because most joint ventures are likewise operated through a conduit organizational form, understanding how organizational form influences acquisition pricing adds to our understanding of the valuation of joint ventures.

This study also contributes to the literature examining organizational form choice (e.g., Shevlin 1987; Guenther 1992; Scholes and Wolfson 1992; Gordon and MacKie-Mason 1994; Ayers et al. 1996; Hodder et al. 2001). Although prior research has analyzed the effect of numerous tax and nontax factors on organizational form choice, to our knowledge the effect of organizational form on acquisition price has not previously been considered.[4] That is, the economic effect that we analyze in this paper is absent from a mature literature in accounting, economics and finance.[5] Because the exit strategy for many new ventures is acquisition/sale (Anders 1999), organizational form-related purchase price effects could have significant wealth consequences for many investors. Therefore, this study suggests that differential acquisition taxation of organizational forms is an additional tax factor that likely influences the organizational form choice.[6]

---

[3] In that section, we also provide some evidence that not all sellers are aware of the potential purchase price premium available in S corporation acquisitions.

[4] Other than Scholes et al. (2005), the economic effect of an entity's organizational form on owner wealth is not considered in other tax texts. The omission of the issue analyzed in this study from standard tax accounting texts, namely the portion of the material that discusses the selection of an organizational form for a new business, is somewhat remarkable.

[5] For example, Scholes and Wolfson (1992, Chap. 3) expresses algebraically the returns to investing through C corporations and conduit entities (e.g., S corporations). Scholes and Wolfson (1992) do not account for the organizational form driven tax-based acquisition pricing effects analyzed in this study. Furthermore, major corporate tax textbooks do not discuss the effect of organizational form on acquisition price as an important factor that investors should consider when deciding how to organize the firm.

In sum, the paper makes a contribution to several major bodies of literature and provides an analysis of an economically important factor that has previously been unexplored. The remainder of the paper proceeds as follows. In Section II, the taxation of taxable acquisitions of C corporations and S corporations is discussed in detail. In that section, we also develop a simple model of acquisition pricing for the two organizational forms. Section III describes sample selection procedures and presents descriptive data on the sample of acquisitions. Section IV includes the empirical analyses and Section V concludes.

II. BACKGROUND ON ORGANIZATIONAL FORM TAXATION AND TAXABLE ACQUISITION STRUCTURES

Prior Tax-Related Acquisition Research

The tax benefits analyzed in prior acquisition related research include post-acquisition use of the target's net operating loss carryforwards, tax benefits from increasing the target's leverage and tax benefits from creating non-debt tax shields via a step-up in the tax basis of the target's assets. Two prior studies (Kaplan 1989; Schipper and Smith 1991) focus on how non-debt tax shields affect premiums in management buyouts (MBOs) of C corporations. Those studies simultaneously analyze the effect of debt-related tax shields on MBO premiums. Both studies conclude that non-debt tax shields generated in MBOs create substantial value for the acquirer and that these tax benefits are equal to a significant portion of the observed acquisition premium. Other studies (e.g., Ayers et al. 2003) investigate how shareholder capital gains taxes influence acquisition prices.

Studies that analyze how taxes affect the structure of an acquisition generally conclude that target tax factors (e.g., step-up in basis, net operating losses) are not of first-order importance in a deal's structure (cash versus stock). For example, Erickson (1998) concludes that tax benefits from stepping up the tax basis of a target's assets are not a primary determinant of deal structure. Similarly, Franks et al. (1988) and Erickson (1998) conclude that shareholder tax consequences were not a significant determinant of the form of consideration employed in a sample of U.K. and U.S. acquisitions, respectively. Both streams of prior research analyze acquisitions of C corporations, but do not consider tax effects in acquisitions of conduit entities such as S corporations.

"C" versus "S" Corporation

When the corporate form is chosen for a business entity, the firm is considered by U.S. tax law to be a "regular" corporation subject to corporate income tax. The "regular" corporation is generally referred to as a "C" corporation because most tax provisions applicable to this type of corporation are contained in Subchapter C of the Internal Revenue Code. This corporate form gives rise to double taxation because shareholders are subject to individual income tax when (1) the after-tax corporate profits are distributed or (2) when they sell their stock.[7]

With the intent of providing shareholders with the advantages of the corporate form (e.g., limited liability), without the disadvantage of double taxation, the tax law allows a corporation to be taxed as a flow-through entity (e.g., partnership) if certain conditions are met and a tax election is made. The tax rules governing this type of corporate organization are contained in Subchapter S of the Internal Revenue Code. Thus, corporations making such an election for tax purpose are referred to as "S" corporations. The result of such an S corporation election is that no income tax is imposed at the corporate level.[8] Instead, shareholders are considered to have received the corporate profits immediately, on which individual income tax has to be paid, effectively making shareholders of such organizations subject to only one level of income tax.

---

[6] In the interest of brevity, and because consideration of this issue here would expand the scope of this study significantly, we leave an analysis of this issue to future research.

[7] President Bush's initial 2003 Tax Plan would have eliminated this second level of tax.

To qualify as an S corporation for tax purposes, the corporation has to meet several requirements relating to: the type of shareholders (no C corporation or partnership shareholders), the number of shareholders (no more than 100 shareholders during the taxable year), the class of stock (only one class of stock is permitted), etc. Once these requirements are met, a revocable election is made, but only with the consent of *all* shareholders. There is no limit on the size of the corporation (e.g., total assets), and some S corporations are rather large.

S corporations provide several advantages relative to C corporations. First, there is only one level of tax levied on the firm's earnings. The disadvantage of the single level of tax is that it falls on the firm's income immediately—there is no tax deferral. Moreover, during the period of study, the top individual investor federal tax rate was 39.6 percent, while the tax rate on corporate income was 35 percent. Thus, operating as an S corporation results in an immediate tax rate on the firm's income that is 4.6 percent in excess of the rate that would apply if the firm were a C corporation. The pass-through nature of an S corporation provides significant tax benefits in the event of losses. Specifically, S corporation losses flow through to owners and can offset other income of the owner. C corporation losses do not similarly flow through to the firm's owners. Rather, they can only be used to offset future period income of the C corporation.

C corporations provide several significant advantages relative to S corporations. First, C corporations face no limit on the type or number of shareholders. For that reason, most publicly traded entities are organized as C corporations. Second, the top marginal tax rate applicable for a C corporation was less than the top marginal tax rate for an individual investor during the period of study. Thus, earnings arising in a C corporation are subject to tax at a lower rate than earnings generated by an S corporation, ignoring the second level of tax on the C corporation. If shareholder taxation of the C corporation's earnings is deferred for a sufficiently long period, then the total tax on the C corporation can be lower than the total tax levied on an S corporation.

It is not difficult to switch from an S corporation to a C corporation or *vice versa*. In addition to transaction costs, there can be tax costs associated with such a conversion, particularly the conversion from C corporation to S corporation. For example, built-in gains on certain assets (e.g., inventory, accounts receivable) are taxable upon conversion, if the C corporation is a cash basis taxpayer pre-conversion.

Optimal Acquisition Tax Structure

Various tax structures can be used in the acquisition of a corporation. Our discussion focuses on taxable acquisition structures only, because the tax effect of interest only arises in taxable transactions. We first describe the tax consequences of taxable acquisitions of freestanding C corporations and S corporations. Our analysis then identifies the optimal transaction tax structure for each organizational form and the range of purchase prices associated with the optimal transaction structure. We also estimate and quantify the tax-based purchase price premium available in S corporation acquisitions by comparing the acquisition prices under the derived optimal transaction structure for each organizational form.

---

[8] Some states levy state income taxes on S corporations.

Taxable Acquisitions of C Corporations

In a taxable purchase of a freestanding C corporation, the acquiring corporation (acquirer) may buy either the assets or the stock of a target corporation (target).[9] In the latter case, it is possible via election to treat a stock purchase, for *tax purposes*, as if the acquirer had purchased the target's assets (a regular §338 election).[10] As a result, the three basic taxable acquisition structures are:

(1) a taxable asset acquisition of the target,
(2) a taxable stock acquisition followed by a regular §338 election, and
(3) a taxable stock acquisition that is not followed by a regular §338 election.

Table 1 details the major tax consequences of each structure to the contracting parties (the target, the acquirer, and the target's shareholders).

If the target's assets are purchased or if a §338 election is made in a taxable stock acquisition (Structures 1 and 2), then the acquirer takes a stepped-up tax basis in the target's assets. As a result of the step-up, the acquired assets are depreciated and/or amortized by the acquirer from a base equal to their fair market value at the time of acquisition. Such a step-up generates an increase in future non-debt tax deductions, an accompanying reduction in future tax liabilities and therefore, positive cash flows. The step-up in tax basis is not obtained without a cost, however, because there can be substantial taxes associated with the asset sale or deemed asset sale.[11]

Table 1 indicates that: (1) a step-up in the tax basis of the target's assets occurs only if the target corporation recognizes a taxable gain, and (2) the target's tax attributes (e.g., net operating loss carryforwards) survive only with Structure 3. Under all three tax structures, target shareholders recognize a taxable gain or loss equal to the difference in value received and their tax basis in the shares surrendered. Thus, with tax Structures 1 and 2, there are two levels of tax (corporate and shareholder), while with Structure 3, there is only one level of tax.

Because the tax consequences of a taxable stock sale accompanied by a §338 election (Structure 2) and a taxable asset sale (Structure 1) are the same for the target shareholders, we compare taxable stock acquisitions without a §338 election to taxable asset acquisitions. Target shareholders are indifferent between transaction tax structures when their after-tax wealth is the same. In a taxable asset sale, the target receives payment for its assets and then distributes the after-corporate-tax proceeds to its shareholders. The distribution to shareholders is equal to:[12]

$$CLP = P_{ast} - [P_{ast} - ASB - (NOL + CL + TC)]*t_c \tag{1}$$

---

[9] Much of the discussion in this section is based on Scholes et al. (2005, Chap. 15).

[10] If the acquirer makes an election under §338, then the target is considered as having sold all of its assets at the close of the acquisition date at fair market value in a single transaction.

[11] Although the target is paying the tax resulting from the §338 election, the tax cost of the election is the contractual obligation of the acquirer.

[12] It is important to note that the analysis below ignores income tax on the state level and target shareholder tax attributes (e.g., capital loss carryforwards) due to the lack of uniformity in tax attributes across shareholders. We also assume that all involved parties face the maximum individual or corporate tax rate.

TABLE 1
Major Tax Consequences of Various Taxable Acquisition Structures

	C Corporation Target			S Corporation Target		
		Stock Acquisition			Stock Acquisition	
Structural or Tax Issue	Asset Acquisition[a]	With a §338 Election[b]	Without a §338 Election[c]	Asset Acquisition[d]	With a §338(h)(10) Election[e]	Without a §338(h)(10) Election[f]
Taxable Gain at Target Corporation Level	Yes	Yes	No	Yes	Yes	No
Taxable Gain Recognized by Target Shareholders	Yes	Yes	Yes	Yes	Yes	Yes
Nature of Target Shareholder Gain	Capital Gain	Capital Gain	Capital Gain	Ordinary Income and Capital Gain	Ordinary Income and Capital Gain	Capital Gain
Step-Up in the Tax Basis of the Target's Assets	Yes	Yes	No	Yes	Yes	No
Target's Tax Attributes Survive	No	No	Yes	NA	NA	NA

---

[a] Transaction in which the target corporation sells its assets to the acquirer for cash. The target corporation pays any resulting tax (or receives a tax refund) on the gain (loss) recognized and distributes the after-tax proceeds of the asset sale to its shareholders in redemption of all of their target stock. The target's stock is then cancelled and the target corporation vanishes.

[b] Target corporation shareholders receive cash from the acquiring firm in return for their target corporation shares. The acquiring corporation then makes a regular §338 election, post-stock acquisition, which results in a deemed sale of the target's assets to a phantom new company. This deemed sale results in a step-up in the tax basis in the target's assets.

[c] Target corporation shareholders sell their stock to the acquirer, but the acquirer does not make the step-up election (regular §338 election). There is no step-up in the tax basis of the target's assets; the acquirer takes a carryover basis in the target's assets.

[d] Transaction in which the target corporation sells its assets to the acquirer for cash. The target corporation does not pay any resulting tax (or receive a tax refund) on the gain (loss) recognized. Any gain or loss recognized passes through to target shareholders.

[e] Target corporation shareholders receive cash from the acquiring firm in return for their target corporation shares. The acquiring corporation and the target's shareholders then make a §338(h)(10) election, which results in a deemed sale of the target's assets. The acquirer takes a stepped-up tax basis in the target's assets.

[f] Target corporation shareholders sell their stock to the acquirer, and the §338 (h)(10) election is not made. There is no step-up in the tax basis of the target's assets; the acquirer takes a carryover basis in the target's assets.

where *CLP* is after corporate tax liquidation proceeds available to target shareholders; t_c is the corporate tax rate (ordinary and capital gain); P_{ast} is the price paid to the target corporation for its assets in a taxable asset acquisition; *ASB* is the net tax basis of the target's assets; *NOL* is target net operating loss carryforwards; *CL* is target capital loss carryforwards; and *TC* is the target's tax credits on a pretax basis.[13] The selling corporation can use these tax attributes (*NOL*, *CL*, *TC*) to offset taxable income resulting from the asset sale. Hereafter, we will represent the aggregate of these three tax attributes as *ATT*.

Target shareholders are subject to capital gains tax on the distribution by the target, and their after tax wealth is equal to:

$$SLP_{ast} = CLP - (CLP - SKB)^{*}t_{cg} \tag{2}$$

where SLP_{ast} is the target shareholder's after-tax cash in a taxable asset sale; *SKB* is target shareholder's stock basis; and t_{cg} is the individual investor capital gains tax rate. Substituting the definition of CLP from Equation (1) into Equation (2) and simplifying, the after-tax cash received by target shareholders in a taxable asset sale is:

$$SLP_{ast} = [P_{ast}(1 - t_c) + ASB^{*}t_c + ATT^{*}t_c]^{*}(1 - t_{cg}) + \mathrm{SKB}^{*}t_{cg}. \tag{3}$$

Similarly, we can represent target shareholder's after-tax cash in a taxable stock sale without a §338 election by the following expression:

$$SLP_{stk} = P_{stk} - (P_{stk} - SKB)^{*}t_{cg} \tag{4}$$

where SLP_{stk} is target shareholder's after-tax cash in a taxable stock sale; P_{stk} is the pretax price paid to target shareholders in a taxable stock acquisition; and other variables are as defined above.

Target shareholders will be indifferent between transaction tax structure when their net after-tax wealth is the same, i.e., $SLP_{stk} = SLP_{ast}$. Simplifying, we find the relationship between the price paid in a taxable stock sale (P_{stk}) and the price demanded by the target shareholders in a taxable asset sale (P_{ast}) is:

$$P_{ast} = (P_{stk} - ASB^{*}t_c - ATT^{*}t_c)/(1 - t_c). \tag{5}$$

The major difference between a taxable stock purchase without a §338 election and a taxable asset purchase is that the latter produces a step-up in the tax basis of the target's assets, which gives rise to valuable tax benefits. To obtain the additional tax benefits from the step-up in basis, the acquirer should be willing to offer a higher price in a taxable asset purchase than in a taxable stock purchase, all else equal. The additional price offered by the acquirer in a taxable asset purchase is limited by the value of these tax benefits from the step-up in basis. The additional price is similarly reduced by the value of the target's tax attributes extinguished in a step-up structure.[14] If we assume straight-line depreciation and amortization for the assets acquired, then the relationship between the price paid in a taxable stock purchase (P_{stk}) and the maximum price that the acquirer is willing to pay in a taxable asset purchase (MXP_{ast}) is:

---

[13] To be able to aggregate all tax attributes, *TC* is stated on a pretax basis to make it comparable to other tax attributes such as *NOL* and *CL*. That is, *TC* is equal to the amount of tax credit divided by t_c.

[14] The target's tax attributes are extinguished in step-up basis type transactions (Structures 1 and 2), but survive in carryover basis transactions (Structure 3).

$$MXP_{ast} = P_{stk} + [(MXP_{ast} - ASB)*d/N]*PV_s*t_c - P_{stk}*r*PV_a*t_c \tag{6}$$

where ASB is the target's pre-acquisition net asset basis; d is the percentage of the step-up in basis attributable to depreciable or amortizable assets;[15] PV_s is the present value of an n period annuity for the step-up; t_c is the corporate tax rate; N is the period over which the step-up will be depreciated/amortized on a straight-line basis; r is the long-term tax-exempt rate set by the government; and PV_a is the present value of an annuity for the tax attributes preserved after a taxable stock purchase.[16] After rearranging and simplifying, we can express Equation (6) as:

$$MXP_{ast} = [P_{stk}(1 - r*PV_a*t_c) - ASB*d*F*t_c]/(1 - d*F*t_c) \tag{7}$$

where F is a present value factor equal to PV_s/N.

Target shareholders will accept a taxable asset transaction structure if the price that the acquirer is willing to pay exceeds the price they demand, i.e., when $MXP_{ast} > P_{ast}$ or when Equation (7) is greater than Equation (5):

$$\begin{aligned}&[P_{stk}(1 - r*PV_a*t_c) - ASB*d*F*t_c]/(1 - d*F*t_c)\\&\quad > (P_{stk} - ASB*t_c + ATT*t_c)/(1 - t_c).\end{aligned} \tag{8}$$

Generally, when discount rates are greater than zero percent and when tax rates are constant, the left-hand side of Equation (8) is less than the right-hand side of the equation. For this reason, the taxable acquisition of a freestanding C corporation is typically accomplished as a stock purchase without a §338 election rather than a taxable asset purchase (or a taxable stock purchase with the §338 election).[17]

Taxable Acquisitions of S Corporations

Like taxable acquisitions of freestanding C corporations, there are three basic taxable transaction structures used to acquire an S corporation. These three structures are listed below and the tax consequences of each structure are described in Table 1.

(1) a taxable asset acquisition of the target;
(2) a taxable stock acquisition followed by a §338(h)(10) election; and
(3) a taxable stock acquisition that is not followed by a §338(h)(10) election.[18]

---

[15] A step-up in the basis of depreciable and amortizable assets leads to tax benefits, while a step-up in nondepreciable assets (e.g., land) does not. A step-up in land can provide tax benefits if and when the land is sold. At that time, the stepped-up basis either reduces the gain on the sale or increases the loss. For the data analyses, we assume that a percentage of the step-up in basis, d, is assigned to depreciable assets.

[16] The annual amount of a target's tax attributes, e.g., net operating loss carryovers, that are available to the acquirer post-acquisition in a taxable stock purchase is limited to the target's pre-acquisition market value (P_{stk}) multiplied by the long-term tax-exempt rate (r) (I.R.C. §382). Other target tax attributes can also be utilized by the acquirer post-acquisition but are subject to similar limitations.

[17] If the target has very large net operating loss carryforwards (NOLs), then a taxable asset purchase or a §338 election can be optimal because the use of the target's NOLs will be limited after a taxable stock acquisition (with no §338 election) due to I.R.C. §382.

[18] Note that in acquisitions of S corporations, the election to step-up asset basis is under §338(h)(10) instead of §338, the election used in the acquisition of freestanding C corporation. While a §338 election is unilaterally made by the acquirer, a §338(h)(10) election has to be jointly made by the acquirer and the target S corporation's shareholders.

As indicated in the far-right columns of Table 1, the target corporation recognizes a gain or loss on the sale when the target sells assets, *or* when the acquirer purchases the target's stock and the target's shareholders and the acquirer *jointly* elect, under §338(h)(10), to treat the transaction as a sale of assets.[19] A §338(h)(10) election is available in the acquisition of an S corporation or in the acquisition of an 80 percent or more owned subsidiary of a C corporation. This election results in the stock sale being taxed as if the target's assets were sold for the stock purchase price.

Shareholders of the target company recognize a taxable gain in each of the three transaction structures. In the first two structures, the taxable gain at the target corporation level flows through to shareholders. Under the third structure, target shareholders directly recognize a capital gain on the sale of their stock.[20] In a taxable asset acquisition or a taxable stock acquisition with a §338(h)(10) election, the acquirer takes a valuable stepped-up basis in the target's assets.

In a stock sale with the §338(h)(10) election (or a taxable asset sale), the gain recognized by the target corporation is either ordinary income or capital gains. In general, recaptured depreciation gives rise to ordinary income, while the excess of the purchase price over the historical cost of the assets is taxed as a capital gain. To the extent the target corporation sells inventory or is deemed to sell inventory, such a gain will be ordinary income. The target S corporation level gains then pass through to shareholders retaining their character (ordinary income or capital gains). Target shareholder after-tax wealth in a taxable stock sale with a §338(h)(10) election is:

$$SLP_{338} = P_{338} - [(P_{338} - HC)*t_{cg} + DPR*t_{oi}] \tag{9}$$

where SLP_{338} is target shareholder's after-tax cash in a taxable stock sale with the election; P_{338} is the purchase price in a taxable stock sale with the election; HC is the historical cost basis of the target's assets; DPR is the accumulated depreciation and amortization associated with the target's assets; t_{cg} is the capital gains tax rate for individual shareholders; and t_{oi} is the ordinary income rate for individual shareholders.[21]

In a taxable stock sale without the step-up election under §338(h)(10), target shareholder's after-tax wealth can be expressed as:

$$SLP_{no338} = P_{no338} - [(P_{no338} - SKB)]*t_{cg} \tag{10}$$

where SLP_{no338} is target shareholder's after-tax cash in a taxable stock sale without a §338(h)(10) election; P_{no338} is the price paid in a taxable stock purchase without the §338(h)(10) election; SKB is the target shareholder's basis in the stock of the target firm; and the other variables are as defined previously.

---

[19] With the election, the deal is taxed as if it were a taxable asset sale. However, for all other purposes, the transaction is a stock sale. Thus, there are no differences between transactions structured with and without the §338(h)(10) election, beyond the tax effects we analyze.

[20] With the first two structures, target shareholders generally do not recognize a taxable gain on the liquidation or deemed liquidation because at the S corporation level, an asset sale or a §338(h)(10) election increase shareholders' stock basis by the amount of the gain. However, it is possible for a taxable gain or loss to be triggered on the liquidation if shareholder stock basis is not equal to the net asset basis of the S corporation. In such case, the net gain (pass through and upon liquidation) is the same as if the stock was sold directly, but the character of the gain (ordinary or capital gain) is not typically the same.

[21] This formulation assumes that the target does not own any inventory, all assets are §1231-type assets, and recaptured depreciation is taxed at ordinary income tax rates. Relaxing these assumptions does not change the tenor of the analyses, only the complexity. Also, it should be noted that as a flow-through entity, an S corporation does not generally retain tax attributes (e.g., NOLs), because it is not taxed at the corporate level.

The target shareholders of the S corporation will be indifferent between the two transaction structures when their after-tax wealth is the same, i.e., when $SLP_{338} = SLP_{no338}$. We can find shareholders' indifference price with the §338(h)(10) election by setting Equations (9) and (10) equal. After simplifying, the relationship between the price demanded by target shareholders in a taxable stock sale with the election and a taxable stock sale without the election is:

$$P_{338} = P_{no338} + (SKB^{*}t_{cg} - HC^{*}t_{cg} + DPR^{*}t_{oi})/(1 - t_{cg}). \tag{11}$$

Because of the step-up in tax basis of the target's assets, the acquirer should be willing to pay a higher *pretax* price if the deal includes the §338(h)(10) election. The maximum price that the acquirer should be willing to offer to obtain the election (MXP_{338}) can be expressed as:

$$MXP_{338} = P_{no338} + [(MXP_{338} - ASB)^{*}d/N]^{*}PV_{s}^{*}t_{c} \tag{12}$$

where P_{no338} is the purchase price in a stock sale without the election, and all other variables are as defined previously. After rearranging and simplifying, we can express Equation (12) as:

$$MXP_{338} = (P_{no338} - ASB^{*}d^{*}F^{*}t_{c})/(1 - d^{*}F^{*}t_{c}) \tag{13}$$

where $F = PV_{s}/N$.

A taxable stock sale with §338(h)(10) election is optimal when the maximum price the acquirer will pay to obtain the election exceeds the minimum price demanded by target shareholders to make the election, i.e., when $MXP_{338} > P_{338}$ or when Equation (13) is greater than Equation (11):

$$\begin{aligned}&(P_{no338} - ASB^{*}d^{*}F^{*}t_{c})/(1 - d^{*}F^{*}t_{c})\\&\quad > P_{no338} + (SKB^{*}t_{cg} - HC^{*}t_{cg} + DPR^{*}t_{oi})/(1 - t_{cg}).\end{aligned} \tag{14}$$

Because the left-hand side of Equation (14) is often greater than the right-hand side of the equation, a §338(h)(10) election is typically the optimal tax structure in the taxable acquisition of an S corporation. This is true because the incremental tax costs of making the election are generally far less than the incremental tax benefits from the step-up (as discussed momentarily).[22] Any price between MXP_{338} and P_{338} leaves both the acquirer and target shareholders better off after-tax than if the deal was structured without the §338(h)(10) election at a price of P_{no338}. The increase in wealth derives from the tax benefits generated by the step-up in the tax basis of the target's assets.

Comparison of the Sale of Similar S and C Corporations

The above analyses show that a taxable stock sale with §338(h)(10) election is usually the optimal transaction structure in the acquisition of S corporations. When the target is a C corporation, the optimal transaction structure is a taxable stock purchase without a regular

---

[22] Our analysis assumes an all-equity-financed firm. In the presence of target firm leverage, the computations and implications are unchanged with one exception. If the target and the acquirer are sufficiently highly leveraged that additional tax deductions from a step-up in the tax basis of the target's assets provide little incremental tax savings, then the benefits of a step-up are overstated in Equation (12).

§338 election. The difference in optimal deal structure is a function of the incremental tax costs and incremental tax benefits of a step-up.

In contrast to C corporations, sales of S corporations taxed as asset sales or deemed asset sales under §338(h)(10) generally do not increase the total amount of the taxable gain. Without such additional taxable gain, the incremental tax cost arising from a step-up when the target is an S corporation arises only from a potentially higher ordinary income tax rates applying to a portion of the gain in an asset sale or deemed asset sale.[23] If such asset sale tax treatment does not create any ordinary income, then the incremental tax cost of a §338(h)(10) election is $0. The incremental tax benefit of a §338(h)(10) election is quantitatively the same benefit available when the target is a C corporation. In sum, the incremental tax cost of stepping up the tax basis of the target's assets is much lower when the target is an S corporation, while the tax benefits of a step-up are equivalent to those available when the target is a C corporation.

The optimal transaction structure in the acquisition of a freestanding C corporation is a taxable stock sale under which the transaction price is P_{stk} (see Equation (8)). Further, the optimal transaction structure in the acquisition of an S corporation is a taxable stock sale with §338(h)(10) election under which the *maximum* price that the acquirer is willing to pay is $(P_{no338} - ASB*d*F*t_c)/(1 - d*F*t_c)$ (see Equation (13)). We define the size of the purchase price premium that an S corporation can fetch relative to an identical C corporation as the difference between these two prices assuming that P_{stk} and P_{no338} are equivalent, and that premium is:[24]

$$PM_{\text{S-corp}} = [(P_{no338} - ASB)*d*F*t_c)/(1 - d*F*t_c). \tag{15}$$

Under a reasonable set of assumptions about depreciable lives and discount rates,[25] Equation (15) indicates that S corporations can fetch a tax-based premium of up to 10–20 percent relative to a similar C corporation.[26]

Notice, however, that if the acquirer obtains all the tax benefits from a step-up in the tax basis of the target's assets, the price at which an S corporation sells will not be different from the price at which a C corporation sells. If acquirers have most or all of the bargaining power in the market for private corporations, then it is quite possible that the acquirer does not pay the target S corporation shareholders a premium for the tax benefits associated with the §338(h)(10) election. If the seller is unaware of the incremental value of the §338(h)(10) election, then it is also possible for S corporation purchase prices to be the same as those for C corporations.[27] Therefore, it is an empirical question as to whether S corporations actually sell at a premium to similar C corporations, and if so, how much of the tax benefits of the election are captured by the seller.

---

[23] This can happen in a transaction taxed as an asset sale, because a portion of the gain can be ordinary income at the S corporation level. This ordinary income passes through to shareholders and is taxable to them as ordinary income (taxed at federal income tax rates as high as 39.6 percent during the period of study). A stock sale results in capital gains, which are taxed at lower rates typically. The total gain in an asset sale or a stock sale is often the same because the shareholders in the S corporation have the same basis in their stock as the S corporation has in its net assets.

[24] This is the upper bound for the premium that the acquirer has to pay in the acquisition of an S corporation. The lower bound of the premium can be computed as the difference between the minimum price demanded by the shareholders in a §338(h)(10) transaction of an S corporation, $P_{no338} + (SKB*t_{cg} - HC*t_{cg} + DPR*t_{oi})/(1 - t_{cg})$ (see Equation (11)), and the price of a taxable stock purchase for a C corporation, P_{stk}. The lower bound can be $0. Notice also that this analysis assumes that the acquirer is a C corporation. If the acquirer were an individual or a pass-through entity, then the analysis would lead to the same fundamental conclusion, but the applicable tax rates would be different (individual investor tax rate instead of the corporate tax rate).

[25] We define reasonable depreciable lives as 10–30 years and reasonable discount rates as 5–15 percent. Other depreciable lives may be appropriate for some assets (e.g., technology, natural resource reserves). Similarly, discount rates change over time with economic and firm specific conditions.

[26] See Scholes et al. (2005, Chap. 15, Table 15.5) for a numerical illustration of potential differences in purchase prices between similar S corporations and C corporations. Equation (15) suggests that C corporations should switch to S corporation status just prior to being acquired. However, C corporations making such a change in organizational form, if subsequently acquired within ten years of the change, are effectively taxed as if they were a C corporation under I.R.C. §1374. Thus, changing organizational form pre-acquisition will not allow selling shareholders to capture the acquisition premium derived in Equation (15).

Before proceeding to the empirical tests, it is important to note several limitations of the analyses in this section. First, we only compare taxable acquisitions of the two organizational forms and our model does not consider tax-free acquisition structures. We also implicitly assume that nontax factors that might influence purchase prices are constant across organizational form.

III. SAMPLE, EMPIRICAL METHOD, AND RESULTS

Sample Selection

We identified a sample of S corporation acquisitions through a keyword search of the Lexis/Nexis database. Specifically, we searched SEC disclosures (8-Ks, 10-Qs, 10-Ks, etc.) for the period 1994–2000 using keywords such as "subchapter S acquisition," "acquisition and S corporation," and "Section 338(h)(10)." The sample includes completed transactions that were announced between January 1, 1994 and December 31, 2000. We restrict the period of study to the post-1994 period because the Omnibus Budget Reconciliation Act of 1993 created Section 197, which makes goodwill tax deductible. This change in acquisition taxation likely had an impact on acquisition structures and prices. We initially identified 104 taxable stock acquisitions of S corporations. We select taxable stock acquisitions of S corporations, rather than taxable asset acquisitions, for our sample because taxable asset acquisitions of C corporations are rare. That is, the population of matched sample C corporation acquisitions includes almost exclusively stock acquisitions, so we choose only stock acquisitions of S corporations to avoid nontax differences between stock and asset acquisitions.[28] All of our S corporation stock acquisitions included §338(h)(10) elections, consistent with our model.[29]

Our empirical tests require target firm financial statement data and we searched the Lexis/Nexis and EDGAR databases for this information. Such data are most often contained as an attachment or exhibit to an acquiring firm's form 8-K, however, in some cases, these data were disclosed in the acquiring firm's 10-Q, 10-K or other SEC filing. Typically, we were able to identify audited financial statements for the acquired S corporation, with one to three years of audited financial statement data provided. Of these 104 transactions, we were unable to locate target firm financial statement data in 27 transactions.[30] After eliminating those deals lacking financial data, we have a final sample of 77 stock acquisitions of S corporations. The aggregate value of these 77 acquisitions is just less than $4 billion. Panel A of Table 2 presents the sample selection procedure.

---

[27] We present anecdotal evidence in the following section that some S corporation sellers are ignorant of the value of the election and do not capture any purchase price premium.

[28] Similarly, we could have analyzed a sample of acquisitions of partnerships relative to a sample of C corporation acquisitions. However, partnerships are different from corporations on nontax dimensions, and we therefore chose to analyze two types of corporations that are taxed differentially, but that are similar on nontax dimensions.

[29] One investment banker with whom we spoke indicated that every S corporation stock acquisition he has completed involved a Section 338(h)(10) election. Stoneridge's January 15, 1999 8-K regarding the acquisition of Hi-Stat is typical of the disclosure regarding a deal's tax structure:

> **Section 338 Election.** With respect to the acquisition of the Shares, the Parties shall together make a timely election under Section 338(h)(10) of the Code. The Parties agree to jointly prepare and timely file Form 8023 and shall allocate the Purchase Price of the Shares in the manner provided in Section 13.3 as soon as practicable after the election is made. Sellers shall execute the Form 8023 at or prior to the Closing.

Panel B of Table 2 presents the sample by year, and indicates that the 77 transactions are clustered in the years 1996 through 1998 with 81 percent of the transactions announced during this period. The sample is distributed across 33 two-digit SICs and there is no significant clustering across two-digit industry (data not tabulated). Panel C of Table 2 presents the sample by one-digit SIC and indicates that the transactions are spread relatively evenly across industries. Panel D provides information on the form of consideration paid to the seller. 47 percent of the S corporation acquisitions were all cash deals. Surprisingly, over 30 percent of transactions involved acquirer stock as part of the total consideration paid to target shareholders. A primary benefit of using stock as consideration in an acquisition is the ability of the seller to garner tax-free treatment. In this sample of transactions, stock is routinely used in taxable transactions.[31] 14 percent of the transactions include a note payable as part of the consideration paid to target shareholders, while 7 percent include some other form of consideration (e.g., warrants).

Our tests require, for comparison, a sample of taxable stock acquisitions of C corporations. We sought an industry-matched sample of taxable stock acquisitions of privately held C corporations. We chose acquisitions of privately held C corporations as matches, rather than acquisitions of public C corporations, because the target S corporations were all private and differences in public/private status might affect purchase prices. We first identified a set of taxable acquisitions of privately held U.S. regular C corporations using the Securities Data Company (SDC) mergers and acquisition database. For each S corporation acquisition, we selected the matched acquisition that was closest in deal size to the S corporation acquisition. Next, for the identified matched transaction, we searched for target firm financial statement information and acquisition agreement documents in acquiring firm SEC financial disclosures. In many cases, we could not find these documents—acquirers did not disclose the purchase agreement and the acquired target financial statements. In that case, we picked the next closest match and repeated the process until we found a matched deal with sufficient disclosures. Based on these disclosures, we assured that the matched transaction involved the taxable purchase of the stock of a freestanding C corporation. We determined the target's organizational form based on disclosures in the target firm's tax footnotes.

Panel A of Table 3 presents the sample of matched freestanding C corporations by year, and indicates that the 77 transactions are clustered in the years 1996 through 1999 with about 90 percent of the transactions announced during this period. The industry distribution is similar to that of the S corporation sample due to matching. Specifically, the sample is distributed across 30 two-digit SICs and there is no significant clustering across two-digit industry (data not tabulated). Panel B of Table 3 presents the sample by one-digit SIC and indicates that the transactions are spread relatively evenly across industries. Panel C provides information on the form of consideration paid to the seller. 65 percent of the S

---

[30] In 11 transactions, we identified financial data relating to the acquisition, but the data were aggregated in a way that was unsuitable for our purposes. For example, in some transactions, the target firm's financial data was aggregated with other unrelated acquisitions in the acquirer's disclosures. Similarly, in some transactions, the acquirer purchased several entities from the same seller. Only one of the entities was an S corporation, but all of the acquired firms' financial information was aggregated into one set of financial statements.

[31] This pattern in the data seems somewhat consistent with Shleifer and Vishny (2003) because acquirers use stock as consideration when it provides no tax benefit to sellers.

TABLE 2
Sample Selection and Composition
Acquisitions of S Corporations Completed during the Period 1994–2000

Panel A: Sample Selection

Initial Sample of S corporation stock acquisitions completed during 1994–2000 as identified with a keyword search of Lexis/Nexis	104
Less: Deals lacking target firm financial statement documents	(27)
Final Sample of S Corporation Acquisitions	77

Panel B: Sample Composition by Year

Year	Number of Deals	Percentage of Total	Deal Value ($ millions)	Percentage of Total
1994	4	5.2%	$182.4	4.7%
1995	1	1.3%	3.7	0.1%
1996	10	13.0%	647.5	16.7%
1997	20	26.0%	659.7	17.0%
1998	33	42.9%	1,550.0	40.0%
1999	5	6.5%	456.7	11.8%
2000	4	5.2%	374.6	9.7%
Total	77	100.0%	$3,874.6	100.0%

Panel C: Sample Composition by One-Digit SIC

One-Digit SIC	Number of Deals	Percentage of Total	Deal Value ($ millions)	Percentage of Total
1	5	6.5%	$61.2	1.6%
2	6	7.8%	236.8	6.1%
3	16	20.8%	1,195.0	30.8%
4	6	7.8%	343.4	8.9%
5	12	15.6%	524.2	13.5%
6	5	6.5%	238.7	6.2%
7	13	16.9%	471.2	12.2%
8	14	18.2%	804.1	20.8%
Total	77	100.0%	$3,874.6	100.0%

Panel D: Sample Composition by Form of Payment

Form of Payment	Number of Deals[a]	Percentage of Total	Deal Value ($ millions)[a]	Percentage of Total
100% cash	42	46.7%	$2,700.9	60.4%
Partially stock	29	32.2%	1,035.2	23.2%
Includes a note payable	13	14.4%	565.3	12.6%
Includes other consideration	6	6.7%	168.1	3.8%
Total	90	100.0%	$4,469.5	100.0%

---

[a] Does not sum to total because some transactions include multiple forms of consideration (e.g., cash and stock).

TABLE 3
Sample Selection and Composition
Acquisitions of C Corporations Completed during the Period 1994–2000

Panel A: Sample Composition by Year

Year	Number of Deals	Percentage of Total	Deal Value ($ millions)	Percentage of Total
1994	1	1.3%	$3.2	0.1%
1995	3	3.9%	6.2	0.2%
1996	14	18.2%	1,181.5	32.0%
1997	21	27.3%	1,070.3	29.0%
1998	20	26.0%	866.6	23.5%
1999	14	18.2%	461.3	12.5%
2000	4	5.2%	102.3	2.8%
Total	77	100.0%	$3,691.3	100.0%

Panel B: Sample Composition by One-Digit SIC

One-Digit SIC	Number of Deals	Percentage of Total	Deal Value ($ millions)	Percentage of Total
1	5	6.5%	$309.6	8.4%
2	6	7.8%	176.2	4.8%
3	16	20.8%	1,226.9	33.2%
4	6	7.8%	594.0	16.1%
5	12	15.6%	483.5	13.1%
6	5	6.5%	91.8	2.5%
7	13	16.9%	460.5	12.5%
8	14	18.2%	348.9	9.5%
Total	77	100.0%	$3,691.3	100.0%

Panel C: Sample Composition by Form of Payment

Form of Payment	Number of Deals[a]	Percentage of Total	Deal Value ($ millions)[a]	Percentage of Total
100% cash	54	65.1%	$2,961.7	77.2%
Partially stock	14	16.9%	502.6	13.1%
Includes a note payable	8	9.6%	234.5	6.1%
Includes other consideration	7	8.4%	138.7	3.6%
Total	83	100.0%	$3,837.5	100.0%

---

[a] Does not sum to total because some transactions include multiple forms of consideration (e.g., cash and stock).

corporation acquisitions were all cash deals. 17 percent of transactions involved acquirer stock as part of the total consideration paid to target shareholders. About 10 percent of the transactions include a note payable as part of the consideration paid to target shareholders, while 8 percent include some other form of consideration (e.g., warrants). This indicates that the matched C corporation sample does not deviate significantly from the S corporation sample.

Table 4 presents descriptive data relating to the 77 S corporation acquisitions and the matched sample of taxable stock acquisitions of C corporations.[32] The average purchase price in the S corporation transactions is $50.31 million, while the average C corporation sold for $47.94 million. The average (median) S corporation reported revenues of $48.80 ($31.64) million in the year prior to the acquisition, while the average (median) C corporation reported revenue of $66.02 ($34.46) million for the same time period. The S corporation and matched C corporation target firms reported similar operating results (e.g., pretax income; earnings before interest, taxes, depreciation and amortization [EBITDA]) in the year prior to the acquisition. The average (median) S corporation target reported average EBITDA to sales of 14.77 percent (8.67 percent). The average (median) EBITDA to sales for the matched C corporation acquisitions is 16.36 percent (11.59 percent). Revenue growth is likewise similar across target organizational form. Overall, the data in Table 4 indicate that the matched sample of C corporations is quite similar to the sample of S corporations in terms of size and financial performance.

Empirical Method

To test the hypothesis that purchase prices are higher in acquisitions of S corporations than in acquisitions of C corporations, we compare purchase price multiples across target organizational form. We compute six purchase price multiples: price to book value, price to revenues, price to pretax income, price to EBITDA, price to operating cash flows, and price to operating cash flows before working capital adjustments.[33] These purchase price multiples are commonly referenced acquisition benchmarks noted in the financial press (e.g., *Wall Street Journal)* and academic texts (e.g., Brealey and Myers 2000). They also provide an objective metric from which to analyze the effect of organizational form on price.

There are, however, several limitations associated with the use of accounting-based multiples. First, for some transactions, the accounting value for the target is negative (e.g., negative cash flows from operations), which produces a purchase price multiple that is meaningless. Second, if organizational form is correlated with some nontax factor that influences purchase prices, such as growth, then purchase price multiples will indicate a tax-based purchase price premium where none exists. To mitigate this problem, in our multivariate tests we attempt to control for growth and other factors that may lead us to incorrectly reject the null hypothesis.

We first perform univariate comparisons of purchase price multiples across target organizational form, and we also estimate a two-stage regression to examine the relationship, if any, between tax benefits and acquisition premiums. In the first stage of the regression, we estimate Equation (16):

$$\begin{aligned}\text{Acquisition Multiple}_i = {} & \alpha + \beta_1{*}ORGFORM_i + \beta_2{*}ROA + \beta_3{*}STOCK_i \\ & + \beta_4{*}DEBT_i + \beta_5{*}GROWTH_i + e_i. \end{aligned} \tag{16}$$

In Equation (16), the dependent variable is one of the acquisition multiples mentioned above. *ORGFORM* is an indicator variable that takes the value 1 if the acquisition target

---

[32] None of the matched sample of transactions included a regular §338 election. This empirical regularity in the data is consistent with conventional wisdom regarding the structure of acquisitions of C corporations.

[33] We add corporate income tax expense to both operating cash flow measures for target C corporations. Because S corporations do not face corporate-level income taxes, adjusting the target C corporation cash flow measures for corporate tax expense provides some control for this difference in target firm financial information.

TABLE 4
Descriptive Financial Data for the Sample of 77 S Corporation Acquisitions Announced during 1994–2000, and the Matched Sample of C Corporation Acquisitions (amounts in $ million)

	Transaction Value	Target Book Value of Equity	Target Revenue	Target Pretax Income	Target EBITDA	Target Operating Cash Flow	Target Operating Cash Flow before Working Capital	Target EBITDA to Revenue	Target Revenue Growth	Target EBITDA Growth	Target Op. Cash Flow b/Working Capital Growth
Panel A: 77 Taxable Stock Acquisitions of S Corporations											
Mean	$50.31	$8.34	$48.80	$3.59	$4.92	$4.18	$4.22	14.77%	15.06%	23.90%	14.70%
Median	29.50	5.03	31.64	1.99	3.42	2.54	2.77	8.67%	12.08%	21.80%	19.74%
Standard deviation	62.32	10.69	53.14	4.98	5.91	5.54	4.66	18.96%	27.11%	49.10%	73.10%
Panel B: 77 Taxable Stock Acquisitions of C Corporations											
Mean	$47.94	$13.02	$66.02	$5.05	$7.94	$4.78	$5.74	16.36%	13.54%	13.54%	23.39%
Median	24.00	5.94	34.46	2.37	4.05	3.18	3.01	11.59%	9.63%	9.63%	25.01%
Standard deviation	60.31	22.93	85.19	9.26	12.54	6.27	8.69	26.37%	28.08%	56.31%	33.85%
Panel C: Difference in Financial Measures between Transaction Tax Structures											
Mean	$2.37	($4.68)	($17.22)	($1.46)	($3.02)	($0.60)	($1.52)	−1.59%	1.52%	10.36%	−8.69%
Median	$5.50	($0.91)	($2.82)	($0.38)	($0.63)	($0.64)	($0.24)	−2.92%	2.45%	12.17%	−5.27%

Transaction value is defined as the price paid for the target's stock. Target book value of equity is the book value of equity of the target in the period prior to the acquisition. Target revenue is gross sales for the target in the year prior to the acquisition. Pretax income is income before taxes for the target in the period prior to the acquisition. Target EBITDA is the target's earnings before interest, taxes, depreciation, and amortization for the year prior to the acquisition. Target operating cash flow is cash flow from operations for the year prior to the acquisition. For C corporations, we add corporate income tax to the operating cash flows as reported in the statement of cash flows. Target operating cash flow before working capital adjustments is cash flow from operations before adjustments for changes in working capital (e.g., accounts receivable). For C corporations, we add corporate income tax expense to operating cash flows before adjusting for working capital changes. Target EBITDA to Revenue is the target's EBITDA in the period prior to the acquisition divided by revenue for that same period.

is an S corporation; 0 if the target is a matched C corporation. As noted above, all transactions are taxable stock acquisitions, so there are no nontax differences associated with the legal structure of the deal across target organizational form. Because we expect to observe higher purchase prices in S corporation acquisitions, the predicted sign of the coefficient on *ORGFORM* is positive. However, the coefficient on *ORGFORM* may pick up both tax and nontax factors.

STOCK is an indicator variable taking the value 1 if the consideration in the deal included acquirer stock; 0 otherwise. All of the transactions in the sample are taxable, so there is no tax benefit associated with stock payments. If the acquirer's stock is fairly priced, then the coefficient on *STOCK* should not be significantly different from zero. If the use of stock is correlated with uncertainty about the target's future profitability, then we expect the coefficient on *STOCK* to be negative. *DEBT* is an indicator variable that takes the value 1 if acquirer debt securities were used as consideration in the acquisition; 0 otherwise. Like *STOCK*, if fairly priced, the coefficient on *DEBT* should be insignificantly different from zero. Using debt in a taxable transaction can provide tax benefits to the seller as a result of installment sale tax treatment.[34] If the acquirer shares in the beneficial tax treatment, the coefficient on *DEBT* will be negative.

GROWTH is the target's asset growth for the period two years prior to the acquisition to the year prior to the acquisition. While imperfect, this variable is designed to capture expected growth in the target's operations. To control for target profitability and profitable growth opportunities, we also include the target's return on assets (*ROA*) in Equation (16). Higher growth firms and more profitable firms should command a higher purchase price and we therefore expect a positive coefficient on *GROWTH* and *ROA*. However, because the numerator in *ROA* is related to the denominator in several of the purchase price multiples, the coefficient on *ROA* may be negative due to this mechanical relationship.

In order to isolate tax benefits associated with the target's organizational form and the transaction's structure, we use the residuals from Equation (16) to proxy for acquisition premiums in the second stage of the analysis. In the second stage, we regress those residuals on an estimate of the tax benefits generated in the S corporation acquisition using Equation (15) above. Specifically, we regress the residuals from Equation (16) on our estimate of the tax benefits from a step-up in asset basis.

IV. RESULTS

Table 5 presents a comparison of purchase price multiples across organizational form for the sample of S and C corporation acquisitions. Panel A presents the price to book multiple where book value is the target firm's book value of shareholder's equity prior to the acquisition. Both the mean and median price to book multiple is higher in S corporation acquisitions.[35] However, the size of the difference is too large to be explained only by tax benefits derived in the acquisition. This is true because the magnitude of the difference implies a purchase price premium in the range of 40–50 percent. Equation (15) suggests a maximum premium in the 20 percent range. Panel B compares price to revenue multiples where revenue is the target firm's gross revenue for the year prior to the acquisition. In the

---

[34] During the period of study, there was substantial uncertainty about the availability of installment sale tax treatment in sales of S corporations. Currently, installment sale treatment is available to selling S corporation shareholders.

[35] S corporations often have lower shareholder's equity than C corporations, for a given amount of corporate earnings, because S corporations pay dividends to shareholders to compensate for the shareholder taxes immediately due on S corporation earnings. However, shareholder's equity is measured and computed the same way for S and C corporations.

TABLE 5

Comparison of Purchase Price Multiples across Target Firm Organizational Form for 77 Matched Pairs of S Corporation and C Corporation Acquisitions Announced during 1994–2000

	S Corporation Targets	C Corporation Targets	Difference	Matched Pair Difference		S Corporation Targets	C Corporation Targets	Difference	Matched Pair Difference
Panel A: Price to Book Multiple					**Panel B: Price to Revenues Multiple**				
Mean	8.28	5.11	3.17*	2.88*	Mean	1.30	1.04	0.26*	0.28*
Median	5.55	3.48	2.07*	1.66*	Median	0.96	0.86	0.10*	0.26*
% positive				65.1%*	% positive				63.4%*
Panel C: Price to Pretax Income Multiple					**Panel D: Price to EBITDA Multiple**				
Mean	16.14	12.81	3.33*	3.06*	Mean	10.20	7.60	2.60*	2.90*
Median	10.88	10.18	0.70	1.89**	Median	8.70	6.13	2.57*	2.10*
% positive				61.8%**	% positive				66.7%*
Panel E: Price to Cash Flows from Operations					**Panel F: Price to Cash from Operations before Working Capital Adjustments**				
Mean	12.17	7.07	5.10*	4.26*	Mean	13.23	9.21	4.02*	5.59*
Median	10.36	6.24	4.12*	3.15*	Median	9.38	7.55	1.83*	3.43*
% positive				63.5%*	% positive				72.3%*

---

*, ** Significant at the 5 percent and 10 percent levels, respectively (one-tailed test).

Price in all multiples is the price paid for the target's equity. The target corporations book value of equity as of the period prior to the acquisition is the denominator in the price to book multiple. Gross revenues is the denominator in the price to revenues multiple, while income before taxes (corporate) is the denominator in the price to pretax income multiple. Earnings before interest, taxes, depreciation, and amortization is the denominator in the price to EBITDA multiple. Price to cash flows from operations uses operating cash flows in the denominator. We add corporate income tax expense to operating cash flows for C corporation targets. Similarly, cash flows from operations before working capital adjustments is the denominator in the price to cash flow from operations multiple. We also add corprate income tax expense to the denominator's value for C corporation targets.

average (median) S corporation transaction, the price to revenue multiple is 1.30 (.96). In the matched C corporation acquisitions, the average (median) price to revenue multiple is 1.04 (.86). The mean and median price to revenue multiple are higher ($p < .05$) in S corporation acquisitions as predicted. We compute both a simple difference in multiples and a difference in acquisition multiple for each matched pair of acquisitions. Both tests yield similar results and the size of the difference in median multiples implies a premium in S corporation acquisitions of about 11.6 percent.

Panel C of Table 5 presents the price to pretax income multiple where pretax income is earnings before income taxes, while Panel D presents price to EBITDA multiples. For both metrics, the mean and median multiple is higher in S corporation acquisitions. Panels E and F present price to cash flow from operations multiples. The mean and median multiples are generally higher in S corporation acquisitions as predicted, but the magnitude of the difference in multiples suggests acquisition premiums in S corporation acquisitions in the range of 30–45 percent, which are too large to be due solely to the tax effect we analyze.

We also report, in each panel of Table 5, the percentage of matched transactions in which the purchase price multiple is higher in the S corporation acquisition than in the C corporation acquisition. In each panel of Table 5, in more than 50 percent of the matched paired transactions, the S corporation multiple exceeds the C corporation multiple. Overall, we interpret the data in Table 5 as supporting the conclusion that S corporations sell for a higher price than similar C corporations.[36]

In Table 6, we provide estimates for the tax benefits generated in the sample of S corporation acquisitions.[37] Specifically, for each acquisition, we estimate the gross step-up in the tax basis of the target's assets as the difference between the purchase price and the target's book value of equity pre-acquisition. As Panel A of Table 6 indicates, in the average (median) S corporation acquisition, the step-up in basis is $42.7 ($23.8) million. We next compute the present value of the tax savings from the step-up in tax basis under differing assumptions about the useful life of the target's assets (15 or 20 years) and the appropriate discount rate (7 percent or 10 percent).[38] The average present value of tax benefits ranges from $6.3 to $9.0 million, which is equivalent to between 12.1 percent and 17.2 percent of the transaction's value (Panel B).[39] For the 77 S corporation acquisitions, our estimates suggest that the aggregate present value of tax benefits is between $490 and $700 million.

In Panel A of Table 7, we estimate Equation (16). The coefficient on *ORGFORM* is consistently positive and significant in Panel A of that table consistent with the conclusion that sample S corporations sell for more than their matched C corporation counterparts. The coefficient on *STOCK* is significant in only one of the regressions in Table 7. If the use of stock by acquirers is prompted in part by information asymmetries about the target, and uncertainty about future target performance, then it does not appear to influence the deal's value for our sample of transactions. Similarly, *DEBT* is not significant in any of the

---

[36] Results are similar when we use enterprise value in the appropriate multiples.

[37] Kaplan (1989) performs similar analyses for a sample of management buyout transactions.

[38] In several transactions, acquirers report their estimate of the present value of tax benefits generated. Based on the acquirer's disclosures and the target's financial statements, it appears that acquirers used discount rates in the 7–9 percent range.

[39] Our estimates calibrate with disclosures made by several acquiring firms. For example, Stoneridge estimated that the tax benefits generated in its acquisition of Hi-Stat were equivalent to about 17 percent of the deal's value ($62 million of tax benefits/$362 million deal value; see the Stoneridge 8-K, January 15, 1999). Likewise, Regal Beloit estimated the tax benefits generated in its acquisition of Leeson Electric were equal to about 18 percent of the deal's value ($47 million of tax benefits/$260 million deal value; see the Regal-Beloit 8-K, October 13, 2000).

TABLE 6
Analysis of Estimated Tax Benefits from a §338(h)(10) Election for 77 S Corporation Acquisitions Completed during 1994–2000

Panel A: Estimated Average and Median Tax Benefits in S Corporation Acquisitions

		Present Value of Tax Benefits from Stepping Up the Tax Basis of the Target's Assets (in $ millions)[a]			
		Amortization Period = 15 years		Amortization Period = 20 years	
	Estimated Gross Step-Up[b]	Discount Rate = 7%	Discount Rate = 10%	Discount Rate = 7%	Discount Rate = 10%
Average	$42.7	$9.0	$7.5	$7.9	$6.3
Median	$23.8	$5.1	$4.2	$4.4	$3.6

Panel B: Estimated Average and Median Tax Benefits in S Corporation Acquisitions as a Percentage of Deal Value

		Present Value of Tax Benefits from Stepping Up the Tax Basis of the Target's Assets (as a percentage of deal value)[a]			
		Amortization Period = 15 years		Amortization Period = 20 years	
	Estimated Gross Step-Up[b]	Discount Rate = 7%	Discount Rate = 10%	Discount Rate = 7%	Discount Rate = 10%
Average	81.4%	17.2%	14.4%	15.0%	12.1%
Median	84.8%	18.0%	15.1%	15.7%	12.6%

Land accounts for less than 1 percent (about 0.5 percent) of the book value of total assets. We assume that land basis is stepped up at the same ratio as other assets.

[a] Computation assumes straight line depreciation over the useful life indicated and that the appropriate tax rate is 35 percent.

[b] Gross step-up is the difference between the purchase price and the tax basis of the target's assets pre-acquisition.

regressions. The coefficient on *GROWTH* is positive as predicted, but insignificant in all regressions in Panel A of Table 7. Changes in total assets over only one year pre-acquisition may be a poor proxy for growth and we unfortunately do not have analyst forecasts or market ratios (e.g., price-to-book) for the private target firms in our sample.[40] Both types of data would likely provide more accurate growth proxies. *ROA* is significant in only one of the regressions, but it is opposite of the predicted sign due to the mechanical relationship between the numerator in *ROA* and the denominator in the dependent variable.[41] The R^2 from these regressions range from .09 to .21. The results in Panel A of Table 7 suggest that purchase prices were higher in the S corporation acquisitions than in the C corporation

---

[40] Results are similar when we use change in revenue as a growth proxy.

[41] We also included measures of target tax attributes (NOLs) in Equation (16), and found that they were insignificant. However, it should be noted that only C corporation targets have such tax attributes. Thus, we did not include those variables in the tabulated results presented in Table 7.

TABLE 7
Estimate of the Effect of Target Organizational Form, Method of Payment, and Growth on Accounting Acquisition Multiples for 77 S and Matched C Corporation Acquisitions Announced during 1994–2000

Panel A: Estimate of the Effect of Target Organizational Form, Method of Payment, and Growth on Accounting Acquisition Multiples

		Acquisition Multiple					
Independent Variable	Predicted Sign	Price to Book Value	Price to Revenue	Price to Pretax Income	Price to EBITDA	Price to Operating Cash Flow	Price to Operating Cash Flow b/Working Capital
Intercept		3.98	1.09	18.29	8.35	6.59	14.53
		(1.67)	(2.93)**	(4.31)**	(4.25)**	(2.90)**	(5.24)**
ORGFORM	+	2.91	0.43	6.21	3.81	6.46	5.38
		(2.12)*	(2.12)*	(3.24)**	(3.53)**	(4.99)**	(3.42)**
ROA		3.50	0.44	−13.46	−2.58	−4.09	−6.65
		(1.41)	(1.35)	(−3.87)**	(−1.29)	(−1.75)	(−2.28)*
STOCK	+	21.50	−0.40	−0.83	0.01	−2.16	0.69
		(1.40)	(−1.69)	(−0.39)	(0.01)	(−1.46)	(0.39)
DEBT	?	−1.62	−0.13	0.85	1.15	−1.99	−1.09
		(−0.62)	(−0.36)	(0.23)	(0.59)	(−0.87)	(−0.37)
GROWTH	+	0.43	−0.14	−0.78	2.36	0.03	−3.07
		(1.63)	(−0.42)	(−0.26)	(1.34)	(0.01)	(−1.22)
MRT		0.88	0.08	−7.97	−3.19	4.52	−11.30
		(0.12)	(1.13)	(−0.65)	(−0.53)	(0.67)	(−1.34)
R^2		0.14	0.09	0.19	0.14	0.22	0.16
n		107	113	107	108	103	106

(continued on next page)

TABLE 7 (continued)

Panel B: Estimate of the Effect of Tax Benefits on Acquisition Premium for S Corporation Acquisitions

Independent Variable	Premium Estimated by the Following Acquisition Multiples					
	Price to Book Value	Price to Revenue	Price to Pretax Income	Price to EBITDA	Price to Operating Cash Flow	Price to Operating Cash Flow b/Working Capital
Tax benefits	0.18 (3.08)**	0.26 (3.49)**	0.14 (2.92)**	0.30 (4.28)**	0.26 (3.58)**	0.32 (4.48)**
F-stat	9.48**	12.19**	8.52**	18.29**	12.83**	20.05**
R^2	0.12	0.16	0.10	0.20	0.15	0.23

---

*, ** Significant at the 5 percent and 10 percent levels, respectively (one-tailed test).

The independent variables are defined as follows. *ORGFORM* is an indicator variable taking the value 1 if the target is an S corporation, 0 if the target is a C corporation. *STOCK* is an indicator variable taking the value of 1 when acquirer stock is a component of the consideration paid to the target's shareholders, 0 otherwise. *DEBT* takes the value 1 if the acquirer purchased the target with debt securities, 0 otherwise. *GROWTH* is the percentage change in the target's gross revenue between year 0 and year −1, where year 0 is the year prior to the acquisition. Acquisition multiples are defined in Table 5. *ROA* is return on assets. *MRT* is acquirer's marginal tax rate as defined by Graham (1996). Tax benefits are the present value of depreciation tax shield estimated by using an interest rate of 7 percent and depreciation life of 15 years deflated by transaction price. Premium is computed as the residual from regressions in Table 6 multiplied by the denominator of the respective multiple (e.g., book value, revenue, EBITDA, etc.), then deflated by transaction price.

acquisitions, after controlling for target growth, profitability, and form of payment.[42] In Panel B, we investigate the link between tax benefits and acquisition premiums in the S corporation acquisitions.

We expect that acquisition premium increases with the tax benefits generated by the §338(h)(10) election. To test this prediction, in Panel B of Table 7, we estimate the acquisition premium for S corporation acquisitions as the regression residuals from Panel A. To measure the premium as a percentage of price, we first convert the regression residuals, which are in the form of an accounting multiple, to a price equivalent. We do so by multiplying the residual by the denominator of the multiple (e.g., revenue, net income, EBITDA, etc.). We then deflate that price premium by the transaction's value, which produces a percentage premium. In Panel B of Table 7, we report the results of regressing this percentage premium estimate, for each of the six multiples, on our estimate of tax benefits generated in the S corporation acquisitions from a step up in tax basis, also scaled by the transaction's value. Thus, we use only the S corporation acquisition data in Panel B.

The coefficient on tax benefits is positive and significantly associated with our estimate of acquisition premium across all specifications in Panel B. The positive coefficient indicates that premiums paid by the acquirer are positively related to the tax benefits generated in the deal. The coefficients on tax benefits range between 0.36 and 0.46, which indicates that for every one dollar of tax benefits generated in the transaction, the premium increases by \$.36 to \$.46. In other words, sellers appear to capture about 40 percent of the tax benefits generated from the §338(h)(10) election, and these benefits are reflected in the acquisition premium. The results in Panel B also suggest that acquirers capture more than 50 percent of the tax benefits arising from the §338(h)(10) election. In other words, acquirers appear to pass on \$.36 to \$.46 of every dollar to tax benefits from stepping up the targets assets, and keep the remainder.

Additional Evidence

The analyses presented in Tables 5 through 7 provide evidence that supports the conclusion that acquisition prices are higher in S corporation acquisitions than in C corporation acquisitions, and that the observed pricing difference is associated with tax effects. In this section, we provide some additional evidence that sellers of S corporations are able to extract a tax-driven purchase price premium in return for joining acquirers in making the §338(h)(10) election.

When Regal-Beloit acquired Leeson Electric (an S corporation) in October 2000, Regal-Beloit described the effect of the §338(h)(10) election on the purchase price paid for Leeson. Specifically, Regal-Beloit noted in its October 13, 2000 8-K that the purchase price multiple for Leeson was higher than the purchase price multiple paid in a recent acquisition of a similar C corporation (Marathon Electric). Moreover, Regal-Beloit seems to represent that the premium was a direct result of the tax benefits derived from the §338(h)(10) election:

---

[42] As pointed out by one referee, S corporations and C corporations differ in the growth in EBITDA and a potentially more appropriate measure of growth is the growth in EBITDA. We also analyze the model by defining growth as the growth in EBITDA. The results across price multiples are not sensitive to the change of growth factor. For example, when growth is measured by the growth in EBITDA and price multiple is defined as price to EBITDA, the overall model is statistical significant at the .03 level, the coefficient on *ORGFORM* is 3.72 (t-statistic = 3.44, p-value < .01), and the coefficient on growth factor is −.04 (t-statistic = −.42, p-value = .67).

> Leeson Electric was acquired for approximately $260 million in cash. The definitive agreement provides for treating the acquisition as a purchase of assets for tax purposes, utilizing a 338(h)(10) election under the Internal Revenue Code. This election will provide Regal-Beloit with a net present value of future tax benefits of an estimated $47 million. When this tax benefit is deducted from the $260 million purchase price, the result is a 7.6 times purchase multiple on Leeson's adjusted EBITDA of approximately $28 million for the 12 months ended June 30, 2000. The purchase multiple paid for the Company's acquisition of Marathon Electric in March 1997 was 7.5 times trailing 12-month EBITDA.

Coca-Cola Enterprises (CCE) acquired Herb Coca-Cola, Inc. in May of 2001 and CCE noted in its July 11, 2001 8-K that:

> The purchase price was comprised of $1.3 billion for the bottling operations and $100 million for the value of incremental tax benefits associated with the structure of the transaction.

We contacted CCE and learned that Herb Coca-Cola, Inc. was an S corporation pre-acquisition and CCE paid Herb Coca-Cola's shareholders a $100 million purchase price premium (as mentioned in the press release) to make the §338(h)(10) election. CCE also represented to us that it valued the tax benefits from the §338(h)(10) election at $145 million. In other words, CCE paid about 70 percent of the total tax benefits ($100 million/ $145 million) in the deal to Herb Coca-Cola's shareholders in the form of a higher purchase price. Our estimates suggest that sellers capture about 40 percent of the tax benefits from the §338(h)(10) election, so this premium is at the higher end of our estimates and CCE personnel confirmed that the seller captured a slightly larger share of the tax benefits in this deal than is typical. The financial professionals to whom we spoke at CCE also indicated that they often pay more for an S corporation than for an identical C corporation for the reasons articulated in Section II.[43]

Similarly, when Stoneridge acquired Hi-Stat (an S corporation) for $362 million in 1998, Stoneridge disclosed that it placed the present value of the tax benefits resulting from the §338(h)(10) election at $62 million. We spoke to individuals involved in the deal and they indicated that Stoneridge paid a premium of between $30 and $35 million to get the §338(h)(10) election, which is equal to about 50 percent of the total estimated tax benefit arising from the election.[44]

We are aware of sales of S corporations involving §338(h)(10) elections in which the seller received absolutely no purchase price premium to make the election. We were contacted by the owner of a relatively large S corporation that was acquired by a publicly held company in 2001 for about $500 million.[45] This seller agreed to make the §338(h)(10) election for no additional compensation.[46] Subsequent to the deal's closing, and based upon the acquirer's 8-K filing, the seller learned that the acquirer valued the incremental tax benefits of the election at $90 million. The seller received $0 of the $90 million of incremental tax benefits arising from the tax election.[47] Similarly, an individual who attended a recent executive education course taught by one of this study's authors explained that six months prior to selling his company to a publicly traded firm, he switched from S corporation status to C corporation status. He further indicated that his advisors did not make him aware of the potential tax-based acquisition premium and that he ultimately lost the option to receive it due to his organization form change.

---

[43] Source: Sara Andersen, Corporate Manger of Acquisitions, at CCE. In the HerbCo deal, Ms. Andersen confirmed that the transaction would not have included the $100 million premium if HerbCo were a C corporation. Thus, consistent with our model and empirical analyses, she confirmed that because HerbCo was an S corporation, Coca Cola paid an approximate 10 percent premium relative to what it would have paid if HerbCo were a C corporation. See also McKay (2001).

[44] The individuals spoke to us on the condition of anonymity. They also indicated that in deriving the $62 million present value of tax savings, Stoneridge used a discount rate equivalent to the then-current Treasury bill rate.

[45] The individual contacted us after reading a *Wall Street Journal* story that mentioned this study.

[46] A possibility is that the S Corp might lack tax sophistication in the transaction resulting in no or a low premium. With the engagement of a tax expert, this disadvantage may vanish.

V. IMPLICATIONS AND CONCLUSIONS

This paper presents a simple model that demonstrates that S corporations can fetch a tax-derived purchase price premium relative to similar C corporations. Based on this model, we compare purchase price multiples in a sample of taxable stock acquisitions of S corporations and a sample of taxable stock acquisitions of C corporations during the period 1994–2000. In general, the empirical results provide evidence supporting the conclusion that the organizational form of a target firm affects acquisition prices. Although the empirical analyses are not uniformly consistent with that conclusion, the data presented in Section IV provides additional evidence that S corporation targets fetch a tax-based purchase price premium relative to similar C corporations. We also estimate the tax benefits realized in the sample of S corporation acquisitions, and on average, these tax benefits are equal to about 12–17 percent of the deal's value. We interpret the overall body of evidence in this study as providing support for the conclusion that the organizational form of a target firm affects the firm's value in an acquisition. Specifically, S corporations can fetch a tax-derived purchase price premium relative to similar C corporations and purchase price premiums can be in the range of 10–20 percent of a deal's value.

Current organizational form, valuation, and corporate finance research (e.g., Palepu et al. 2000; Brealey and Myers 2000) are silent on the impact of target firm organizational form on fair market values—the price at which assets change hands between willing sellers and buyers. This study provides evidence that in sales of privately held corporations, the target's organizational form influences purchase prices.

The results of this study indicate that investors opting to organize the firm as a C corporation forgo significant cash flows if and when the firm is sold. The fact that so many entities are C corporations suggests that the nontax benefits associated with this organizational form (e.g., access to capital markets, ability to accommodate institutional ownership, stock option compensation plans) must be greater than the tax benefits associated with conduit organizational forms documented in this study.[48] Future research that identifies and quantifies these nontax benefits of the C corporation form may therefore be very insightful.

---

[47] We received independent (unsolicited) corroboration of these facts from a former student who worked at the investment bank that advised the acquirer on the transaction. Consistent with our discussions with the seller, this student indicated that the seller was ignorant of the incremental benefits of the 338(h)(10) election and that the acquirer captured the entire $90 million of tax benefits resulting from that election.

[48] Consider for example Cerent, which was acquired by Cisco for $6.9 billion in 1999 (see *Seattle Times* 1999). Privately held Cerent was organized as a C corporation. Had it been an S corporation, an additional purchase price premium of up to $1 billion would have been possible. Such a premium would have left Cerent's shareholders with approximately three-quarters of a billion dollars more after-taxes than they actually received in the acquisition.

REFERENCES

Anders, G. 1999. IPO Study finds tech firms chose to be acquired. *Wall Street Journal* (January 26): C14.

Asquith, P., R. Bruner, and D. Mullins. 1983. The gains to bidding firms from merger. *Journal of Financial Economics* 11: 121–140.

Ayers, B., B. Cloyd, and J. Robinson. 1996. Organizational form and taxes: An empirical analysis of small businesses. *The Journal of the American Taxation Association* 18 (Supplement), 49–67.

———, C. Lefanowicz, and J. Robinson. 2003. Shareholder taxes in acquisition premiums: The effect of capital gains taxation. *Journal of Finance* 58: 2783–2801.

Brealey, R., and S. Myers. 2000. *Principles of Corporate Finance*. Sixth edition. Boston, MA: McGraw-Hill.

Dhaliwal, D., M. Erickson, and S. Heitzman. 2004. The effect of seller income taxes on acquisition price: Evidence from purchases of taxable and tax-exempt hospitals. *The Journal of the American Taxation Association* 26: 1–21.

Engel, E., M. Erickson, and E. Maydew. 1999. Debt-equity hybrid securities. *Journal of Accounting Research* (Autumn 1999): 249–274.

Erickson, M. 1998. The effect of taxes on the structure of corporate acquisitions. *Journal of Accounting Research* 36: 279–298.

———, and E. Maydew. 1998. Implicit taxes in high dividend yield stocks. *The Accounting Review* 73: 435–458.

———, and S. Wang. 1999. Exploiting and sharing tax benefits: Seagram and Du Pont. *Journal of the American Taxation Association* 21: 35–54.

———, ———. 2000. The effect of transaction structure on price: Evidence from subsidiary sales. *Journal of Accounting and Economics* 30: 59–97.

Franks, J., R. Harris, and C. Mayer. 1988. Means of payment in takeovers: Results for the United Kingdom and the United States. In *Corporate Takeovers*, edited by A. J. Auerbach. Chicago, IL: University of Chicago Press.

Gordon, R., and J. MacKie-Mason. 1994. Tax distortions to the choice of organizational form. *Journal of Public Economics* 55 (2): 279–306.

Graham, J. 1996. Proxies for the corporate marginal tax rate. *Journal of Financial Economics* 42: 187–221.

Guenther, D. 1992. Taxes and organizational form: A comparison of corporations and master limited partnerships. *The Accounting Review* 67: 17–45.

———. 1994. The relation between tax rates and pretax returns: Direct evidence from the 1981 and 1986 tax rate reductions. *Journal of Accounting and Economics* 18: 379–394.

Hodder, L., M. McAnally, and C. Weaver. 2001. The influence of tax and nontax factors on the organizational form of banks. Working paper, The University of Texas.

Kaplan, S. 1989. Management buyouts: Evidence on taxes as a source of value. *Journal of Finance* 44: 611–632.

Landsman, W., and D. Shackelford. 1995. The lock-in effect of capital gains taxes: Evidence from the RJR Nabisco leveraged buyout. *National Tax Journal* 47: 245–259.

Lang, M., and D. Shackelford. 2000. Capitalization of capital gains taxes: Evidence from stock price reactions to the 1997 rate reduction. *Journal of Public Economics*.

Maydew, E., K. Schipper, and L. Vincent. 1999. The effect of taxes on divestiture method choice. *Journal of Accounting and Economics* 28: 117–150.

McKay, B. 2001. Coca-Cola Enterprises is set to acquirer bottlers Hondo, Herbco for $1.07 billion. *Wall Street Journal* (May 1): A3.

Palepu, K., V. Bernard, and P. Healy. 2000. *Business Analysis and Valuation*. Cincinnati, OH: Southwestern Publishing.

Schipper, K., and A. Smith. 1991. Effects of management buyouts on corporate interest and depreciation tax deductions. *Journal of Law and Economics* 34: 295–341.

Scholes, M., and M. Wolfson. 1992. *Taxes and Business Strategy: A Planning Approach*. Englewood Cliffs, NJ: Prentice Hall.

———, ———, M. Erickson, E. Maydew, and T. Shevlin. 2005. *Taxes and Business Strategy*. 3rd edition. Upper Saddle River, NJ: Prentice Hall.

Seattle Times. 1999. Cisco pays $7.4 billion for 2 data-network firms. (August 26).

Shackelford, D. 1991. The market for tax benefits: Evidence from leveraged ESOPs. *Journal of Accounting and Economics* 14: 117–146.

Shevlin, T. 1987. Taxes and off-balance-sheet financing: Research and development limited partnerships. *The Accounting Review* (July): 480–509.

Shleifer, A., and R. Vishny. 2003. Stock market driven acquisitions. *Journal of Financial Economics* 70: 295–311.

Weston, J. 2001. *Cases in Dynamic Finance: Mergers and Restructurings*. Upper Saddle River, NJ: Prentice Hall.

THE ACCOUNTING REVIEW
Vol. 82, No. 2
2007
pp. 389–425

The Retention Effect of Withholding Performance Information

Korok Ray
University of Chicago

ABSTRACT: It is a common practice for firms to conduct performance evaluations of their employees and yet to withhold this information from those employees. This paper argues that firms strategically withhold performance information to retain workers. In particular, if the worker enjoys high outside options and is tempted to quit, then the firm chooses not to reveal his performance information in order to keep him on the job. The firm's equilibrium strategy is to fire if performance is sufficiently low, reveal information if performance is sufficiently high, and withhold information otherwise. The pooling equilibrium is robust under a wide variety of settings, such as general cost functions, ability-contingent outside options, nonlinear contracts, nonverifiable output, and multiple stages of production.

Keywords: *performance measurement; performance evaluation; information revelation; disclosure.*

I. INTRODUCTION

A large literature in management and compensation documents the common practice of firms conducting performance evaluations of employees and yet withholding this information from those employees.[1] For example, Murphy and Cleveland (1991) find that managers often lump workers who have different performance levels into a single category, suggesting that the reported distribution of performance is less variable than the true distribution of performance. The standard explanation from the management literature is based on psychology and politics: revealing true output to employees kills morale and creates animosity within the firm; thus, firms tell all workers that they are above average. While these explanations are plausible, this paper argues that there is an economic force driving this phenomenon: firms withhold performance information to retain workers.

---

[1] According to Saal et al. (1980), leniency, range restriction, and halo error are the effective categories that encompass forms of withholding. See Landy and Farr (1980), Milkovich and Newman (1996), Milkovich and Wigdor (1991), and Mohrman and Lawler (1983) for surveys of the literature.

This paper is based on Chapter 2 of my dissertation submitted to Stanford University. I owe the greatest debt to my thesis advisor, Edward Lazear, for years of guidance. John Roberts, Bill Rogerson, Madhav Rajan, Stefan Reichelstein, Canice Prendergast, Luis Rayo, Andy Skryzpacz, Lars Stole, Milt Harris, two anonymous referees, and seminar participants at Stanford University, the University of Chicago, and the Chicago/Minnesota Theory Conference all provided many helpful comments. Maris Goldmanis and Marco Fiaccadori provided excellent research assistance. Stanford University Graduate School of Business and the University of Chicago Graduate School of Business provided generous financial support.

Editor's note: This paper was accepted by Madhav Rajan.

Submitted September 2005
Accepted July 2006

To show this, I construct an agency model consisting of a risk-neutral principal (the firm) contracting with a risk-neutral agent (the worker) under limited liability. The steering assumption is that the firm observes the worker's job-specific ability, but the worker himself does not. In practice, evaluating performance is a complex activity, and once firms conduct such evaluations they may choose whether and how much of that evaluation to reveal to the worker. Note that this assumption differs from the standard adverse selection models in which the agent holds private information.[2] Here, the principal must decide whether to reveal her private information, possibly for strategic purposes.

For example, consider that a firm hires an employee and observes his job-specific ability. Firms have expertise in the nature of their business and have experience hiring and firing workers, so it is plausible that the firm can better differentiate a high-ability worker from a low-ability worker than the worker himself can. After observing the worker's ability, the firm can choose whether to disclose this information to the worker. Following this disclosure, the worker can choose to quit the firm and work elsewhere, or stay. As is common in most production settings, ability and effort are complements, so more able workers have higher marginal products of effort.

The two key assumptions in the model are complementarity in production and the option to quit at the interim stage. Because of complementarity between effort and ability, a highly able agent works hard because the marginal return from his labor is higher. Thus, the firm wants to reveal output for workers with high ability. On the other hand, the agent has the option to leave the firm after the evaluation and collect his outside option. Limited liability creates a conflict of interest between the principal and the agent, and, hence, there will be times when the firm wishes to retain the agent but the agent wishes to quit. This gives the firm an incentive to withhold information in order to strategically retain workers. Complementarity in production pushes the firm to reveal information, while the retention motive pushes the firm to withhold information.

The trade-off of these two forces creates a unique equilibrium in which the firm reveals information if output is very high or very low, but withholds information if output is in-between. Profit from retaining workers who otherwise would have quit gives the firm incentives to expand the pool. However, complementarity in production makes pooling costly, and this places a bound on the optimal size of the pool. In equilibrium, the firm selects the pool such that the average member of the pool is exactly indifferent between staying at the firm and leaving. This equilibrium of pooling in the middle and separating at the extremes is consistent with performance evaluations in practice (see Milkovich and Wigdor [1991] and surveys such as Murphy and Cleveland [1991]), where workers are either laid-off, promoted, or told that they are average (Milkovich and Newman 1996, 360–370).

The pooling equilibrium is robust under a wide variety of settings. First, there still exists a pooling equilibrium when outside options are contingent on ability. Second, I show the equilibrium holds if the worker's output is nonverifiable, so the firm announces a report of the agent's early-stage output, which the agent may or may not believe. To prevent the firm from arbitrarily biasing its report, it is necessary for the firm to make a transfer payment to the agent contingent on its announcement. Third, I consider nonlinear compensation schemes. While nonlinearity complicates the analysis, making the payoff functions convex and concave in places, I show that, under mild conditions, it is still profitable for the firm to withhold information.

---

[2] See Baiman (1990) and Lambert (2001) for reviews of such models in the accounting literature.

Motivation and Related Literature

Psychology is the most common explanation for the withholding of performance information from employees. Saal and Knight (1988) suggest several widely accepted accounts of withholding, including the desire to be liked, unwillingness to give negative feedback, fear that other managers inflate their ratings, and abnormally high or low criteria.[3] Specifically, Jones et al. (1983) argue that "the individual who receives an average performance assessment may feel punished because of a belief that a higher rating was deserved," which may decrease future productivity. To prevent discouragement among employees, managers refrain from fully disclosing performance information.

Politics is the other common explanation of withholding performance information.[4] For example, Longenecker et al. (1987) conducted in-depth interviews with 60 upper-level executives and found that executives "deliberately distort and manipulate evaluations for political purposes." The underlying justification for political considerations is a concern about "how to best use the evaluation process to motivate and reward subordinates." There is a widespread belief, documented in Milkovich and Newman (1996) that disclosing performance information will create animosity among co-workers and subsequently cause productivity to suffer. Schall (1983) further demonstrates that political considerations often develop into sets of unwritten rules that permit managers to communicate poor performance evaluations to subordinates without formally giving low ratings.[5] According to this literature, political considerations within firms are thus a significant factor of the practice of withholding performance evaluation information.

There are only a handful of papers that explore information disclosure in performance evaluations, and none of them consider the effects of retention. MacLeod (2003) proposes a model of subjective evaluations and finds that the firm will compress the distribution of performance if the principal and agents receive conflicting signals on the agent's performance. Lizzeri et al. (2002) explore the incentive effects of revealing information to employees. They find that under some conditions, the expected cost to the principal of inducing a given level of effort is lower if the agent cannot condition his second-stage effort on early-stage output. Once again, neither paper assumes complementarity across stages or the option to quit at the interim stage.

The model here bears some similarity to the career concerns literature (Gibbons and Murphy 1992; Holmstrom 1999; Meyer and Vickers 1997), though the trade-offs and nature of information asymmetry are different. For example, ability and effort are complements in the model of Holmstrom (1999), but the principal (the market) does not know the manager's ability, causing him to work hard early in his career to influence market perceptions on his ability. In my model, the principal (the firm) knows the agent's ability, so the main trade-off is between disclosure and retention.

There is a rather large body of literature on the voluntary disclosure of private information in asymmetric information games.[6] The classic early results in this literature

---

[3] See Arvey and Jones (1985), who suggest that discipline and punishment have not sufficiently been studied in organizational settings, and where these topics have been studied, evidence shows that performance evaluation is sometimes used as a vehicle for discipline. Kay et al. (1965) show specifically that increasingly threatening assessments yield decreasingly favorable attitudes and declining subsequent constructive improvement in job performance.

[4] See Bernardin and Beatty (1984), who point out that performance evaluation occurs in circumstances that do not always allow for rationality, straightforwardness, or objectivity in evaluation. Cleveland et al. (1986) suggest that managers first determine the overall rating and then go back and fill in the details of the rating.

[5] Schall (1983) deems these rules "tacit understandings (generally unwritten and unspoken) about appropriate ways to interact (communicate) with others in given roles and situations."

[6] For an extensive review of this literature in a capital markets context, see Verrecchia (2001).

(Grossman and Hart 1980; Grossman 1981; Milgrom 1981) showed that private information is fully revealed in equilibrium if disclosure is costless and there is a monotonic ordering of "favorable" versus "unfavorable" news. Later research identified conditions under which this full disclosure or "unraveling" result breaks down and information withholding can take place. These include (1) costly disclosure of information, for example, due to its proprietary nature (Verrecchia 1983); (2) uncertainty as to whether the informed party actually possesses the information (Dye 1985; Jung and Kwon 1988; Shin 1994); and (3) failure of the monotonicity assumption on the "favorableness" of news, since favorable financial market news could increase competition and thus have not only positive, but also negative consequences for the firm (Darrough and Stoughton 1989; Okuno-Fujiwara et al. 1990). While most of the earlier literature focuses on a simple binary choice between disclosure and nondisclosure, a number of the more recent papers also address partial revelation and noisy signals (Newman and Sansing 1993; Okuno-Fujiwara et al. 1990).

My paper addresses a similar question as the disclosure literature: When is it optimal for an informed party not to reveal its private information to an uninformed party? However, my model differs from the existing disclosure literature in at least two ways. First, I consider information revelation in an agency model, whereas most of the disclosure literature focuses on capital markets. Second, and most importantly, the firm in my model can commit to an information partition prior to obtaining private information, whereas in most of the models discussed the decision to reveal is conditional on existing information. This ability to commit is important in obtaining the equilibrium with information withholding, even though there is still monotonicity of the "favorableness" of news. While it would be optimal for the firm *ex post* to fully reveal the higher values from the pooling interval, it is optimal *ex ante* to commit not to do so. The firm will withhold information from both the upper and lower ends of the pool, and the gain from the latter is greater than the loss from the former.[7]

The paper is organized as follows. Section II presents the basic model and solves for the first best outcome. Section III imposes a limited liability constraint and establishes the payoff functions of both parties under the full revelation benchmark—the restricted game in which the principal reveals output. Section IV lays out the partial revelation game in detail, and establishes properties of the principal's and agent's payoff functions. Section V proves the main result, and Section VI shows the robustness of the equilibrium. Section VII concludes.

II. THE MODEL

An employee (an agent) works on a project for a firm. Both parties are risk neutral. The agent has ability θ and exerts effort e at cost $C(e)$, where C, C', and C'' are positive for all $e > 0$. To ease calculations, I assume the marginal cost function is log-concave. This is a weak assumption satisfied by virtually every cost function ever used in applied agency models, such as the class of power functions.[8]

---

[7] Note that in order to have conflicting incentives for the revelation of the entire pooled interval, we do not need conflicting incentives for revelation of each particular point in the interval, and thus there is no need for multiple audiences as in Darrough and Stoughton (1989) or Newman and Sansing (1993).

[8] See Bagnoli and Bergstrom (2005) for discussion of the assumption of log-concavity. While this assumption simplifies analysis of equilibrium, the main result still holds without it, as shown in Section VI.

The agent produces output:

$$q = \theta e + \varepsilon.$$

The noise term $\varepsilon \in [0,\infty)$ is distributed around a mean of m, with cumulative distribution function (cdf) $G(\cdot)$ and density function $g(\cdot)$. The total value of the project is Vq. Note that q is a function of θe, so ability and effort are complementary inputs to production; a marginal increase in θ increases the marginal productivity of effort. The agent observes his effort, but the firm does not. Ability θ and effort e are noncontractible, but output q is contractible. Noncontractibility of θ represents (1) that contracts are written before knowledge of ability is realized or collected, and (2) that there are exogenous costs of contract complexity. Ability, like effort, is difficult to measure and hence cannot form the basis for contracts.

The ability parameter $\theta \in (0,\infty)$ is distributed randomly with cdf $F(\cdot)$ and density function $f(\cdot)$. The agent does not observe his own ability, but the firm does (as a result of the firm's prior experience with the agent). The firm can choose to reveal or not reveal θ to the agent. The agent will use his knowledge of θ to decide whether to work on the project, and to select his appropriate effort level. Once revealed, ability information is *ex post* verifiable by the agent.[9] So if the principal decides to reveal ability, then she will do it truthfully. This focuses the problem on whether to reveal information at all, and not on whether to distort revealed information.

Finally, both the principal and the agent have outside options. This captures the value from quitting the project and dedicating resources (labor, capital) elsewhere. Let $\bar{u}_1^a$ and $\bar{u}_1^p$ denote the agent's and the principal's outside options before they enter in a contractual relationship with each other (and before the firm observes the agent's ability). Let $\bar{u}_2^a$ and $\bar{u}_2^p$ be the respective outside options right before deciding whether to work on the new project (but after the firm has observed ability). Call $\bar{u}_2 = \bar{u}_2^a + \bar{u}_2^p$ the residual surplus: the total surplus from abandoning the project. I assume that $Vm < \bar{u}_2^a$ and $Vm < \bar{u}_2^p$, so neither party would want to work on the project if no effort is exerted, even if that party received the whole surplus from production. Finally, the principal and agent must satisfy the participation constraint (PC) that their equilibrium payoffs must exceed $\bar{u}_1^p + \bar{u}_2^p$ and $\bar{u}_1^a + \bar{u}_2^a$, respectively.

First Best

This subsection establishes the first best benchmark useful for the rest of the paper: it is efficient for the firm to fully reveal θ, and it is efficient to quit projects when the employee's ability turns out to be low. The first result states that more information is always socially optimal, and so strategic information revelation generates welfare losses. The second result shows that it is efficient to terminate bad projects because firms and workers have outside options.

As mentioned earlier (and proved in later sections), the firm will withhold information in order to retain the worker. Precisely, there are conditions under which a worker prefers to leave the firm but the firm wants him to stay. These conflicts of interest are absent in the social planner's problem. The planner simply terminates workers at the efficient rate, and, hence, there is no reason to withhold ability information. All proofs are in the Appendix.

---

[9] I relax this assumption later in the paper.

Proposition 1: It is efficient to fully reveal ability.

In fact, withholding information makes the planner (weakly) worse off, since it prevents effort from accurately conditioning on ability. To see this, suppose $\Theta \subset R$ is a nontrivial pooling region. If the planner chooses to pool, then the effort function must be constant over Θ. If the planner reveals information, then the effort function is unconstrained over Θ. So pooling shrinks the planner's choice set of all possible effort functions. This forces the planner to optimize over a smaller set, and, hence, total surplus decreases. A key figure in the planner's optimization problem is the continuation surplus function:

$$S(\theta) = \max_{e}\{EV(\theta e + \varepsilon) - C(e)\} = V(\theta e(\theta) + m) - C(e(\theta)),$$

where E is the expectation with respect to ε. This is the total surplus from continuing for each realization of ability θ. The effort function is increasing because effort and ability are complementary. So the agent works harder if he knows he has more ability because the marginal return to his labor is now higher. The social planner's termination rule takes the form of a cutoff rule. In other words, terminating low ability workers is efficient.

Proposition 2: There exists a cutoff point θ^* such that it is efficient for only workers with $\theta > \theta^*$ to work on the project.

Here, θ^* is the efficient termination rule. The proof of this proposition uses the envelope theorem and the first-order conditions on $e(\cdot)$ to show that the continuation surplus function is increasing. As usual, it is possible to implement the first best with a standard sell-out contract, where the agent pays the firm upfront the equilibrium value of output less equilibrium cost of effort and less the agent's outside option, and the firm is able to give the agent a full share in the output from production.

III. FULL REVELATION

To build intuition and establish preliminary results, I first solve the model for the Full Revelation (FR) case. Assume that the principal can fully commit to reveal θ to the agent. A contract is a tuple $\langle T_p, s_1, s_2, b\rangle$, where $T_p \subseteq R_+$ is the firing rule (fire if $\theta \notin T_p$), s_1 is salary paid for participation in the initial (evaluation) stage,[10] s_2 is salary paid for participation in the project itself, and b is the bonus on final output q. Compensation for the agent is a linear function of final output, so he receives $s_1 + s_2 + bq$ if he ends up working on the project, and s_1 otherwise. This assumption of a sharing rule b and salaries s_1 and s_2 that are independent of θ is reasonable in a setting where bonuses are negotiated before the evaluation stage. Of course, the agent's total compensation still contains risk, since q is still a random variable, realized only at the end of the production stage.[11]

Given this contract, the agent responds by choosing actions $\langle T_a, e(\cdot)\rangle$: a quit rule $T_a \subseteq R_+$ (quit if $\theta \notin T_a$) and an effort function $e(\cdot)$. Let $T = T_a \cap T_p$. Since output must clear both hurdles for the agent to advance, the probability of advancing to the production stage is $P(T) = \Pr(\theta \in T)$. Conditioning on θ, the agent's and principal's continuation utilities are:

---

[10] Even though production occurs in a single stage, as described in the setup of the model, production is preceded by an evaluation stage, during which the firm finds out the agent's ability level.

[11] Contracts that are not linear in final output are considered in the "Robustness" section of the paper. While not all results obtained for linear contracts carry over to the general case, I show that the main result is still valid: even with general contracts, there exist conditions under which it is optimal for the firm to withhold information. However, the assumption that the contract cannot be conditioned on ability is important—without this assumption, it would in general be more profitable to retain marginal agents by means of lump-sum payments to these agents rather than by pooling.

$$u(\theta) = E[b(\theta e(\theta) + \varepsilon) + s_2 - C(e(\theta))] = b(\theta e(\theta) + m) + s_2 - C(e(\theta))$$
$$\pi(\theta) = E[(V - b)(\theta e(\theta) + \varepsilon) - s_2] = (V - b)(\theta e(\theta) + m) - s_2.$$

Given a contract $\langle T_p, s, b\rangle$, the agent's problem is:

$$\max_{T_a, e(\cdot)} \int_T u(\theta)f(\theta)d\theta + (1 - P(T))\bar{u}_2^a + s_1$$

subject to (PC)

where T is a function of T_a and (PC) is the participation constraint. In words, if $\theta \in T$, then the agent advances and receives $u(\theta)$. If not, then he receives $\bar{u}_2^a$. He bears $C(e)$ only if he advances. Note that $C(e)$ is embedded in $u(\theta)$ and so does not appear in the above optimization explicitly. If the agent advances, then the principal receives $\pi(\theta)$ for each $\theta \in T$, and if the agent leaves, then the principal receives her outside option $\bar{u}_2^p$. The principal selects a target, bonus, and salary to maximize her expected utility, so she solves:

$$\max_{T_p, b, s_1, s_2} \int_T \pi(\theta)f(\theta)d\theta + (1 - P(T))\bar{u}_2^p - s_1$$

subject to (PC).

Proposition 3: The effort function $e(\theta,b)$ is increasing in θ and b. The continuation payoffs $u(\theta)$ and $\pi(\theta)$ are increasing and convex. The agent and the principal adopt cutoff strategies for separation: $T_a = [\theta_a,\infty)$ and $T_p = [\theta_p,\infty)$.

The first order conditions (F.O.C.) shows that $C'(e(\theta)) = b\theta$, and so the effort function is in fact a function of both the incentives b and the information θ (but is independent of the salaries s_1 and s_2). Because ability and effort are complements, a high θ affects the marginal productivity of effort, so effort will increase for high realizations of ability.

The shape of the effort function $e(\theta)$ determines the shape of the principal's continuation payoff $\pi(\theta)$ and the agent's continuation payoff $u(\theta)$. In particular, if $e(\theta)$ is increasing, then u and π will be convex. Higher ability levels are increasingly profitable for both the principal and the agent. Once again, this is driven by the complementarity between ability and effort. If θ is large, then the agent's marginal productivity of effort increases, and so final output will be large. Monotonicity of the continuation payoff functions implies that both parties will use cutoff strategies for separation. In particular, the agent will continue if and only if $u(\theta) \geq \bar{u}_2^a$, and since u is increasing, this holds if and only if $\theta \geq \theta_a$. Similarly, the principal will continue if and only if $\theta \geq \theta_p$. Thus, the separation rules are fully described by their cutoff values θ_a, θ_p and $\tau = \max\{\theta_a, \theta_p\}$. In addition, $1 - P(T) = F(\tau)$. I will refer to θ_p and θ_a as the principal's and agent's (respectively) targets, hurdles, and termination rules interchangeably.

At the optimum, the agent is indifferent between staying and leaving, and the principal sets θ_p such that $\pi(\theta_p) = \bar{u}_2^p$. The principal sets the lowest possible salary level s_1 to guarantee participation. Given θ, the agent's and principal's expected payoffs are given by:

$$U(\theta) \equiv \begin{cases} u(\theta) & \text{if } \theta > \tau \\ \bar{u}_2^a & \text{otherwise} \end{cases} \qquad \Pi^R(\theta) \equiv \begin{cases} \pi(\theta) & \text{if } \theta > \tau \\ \bar{u}_2^p & \text{otherwise.} \end{cases}$$

In choosing the incentive coefficient b, the principal trades off two separate forces. As she increases b, she induces more effort out of the agent (an incentive effect), which generates more output and hence more profit. But increasing b also reduces the principal's share of final output, since she earns $(V - b)q$. The optimal $b^* \in (0,V)$, so the principal gives the agent some but not full incentives. Because the effort function is increasing in b for each θ, this shows that the second-best effort level is less than the first-best optimum.

Proposition 4: The salary s_1 is positive only if the agent's participation constraint binds in equilibrium. The salary s_2 is positive only if $\theta_a > \theta_p$ in equilibrium.

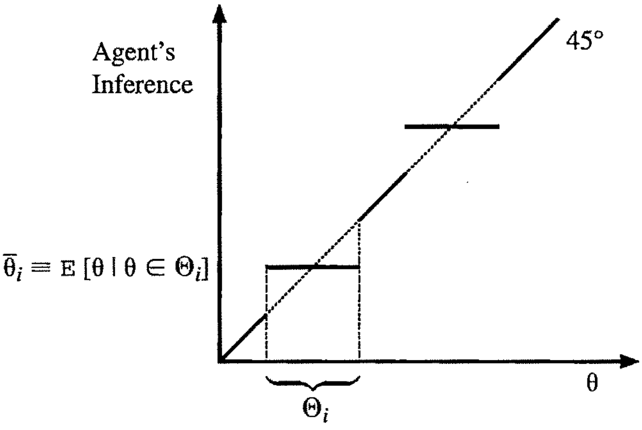
The proposition shows that the salary s_1 is paid only if it is necessary to induce agents to enter the contractual relationship with the firm, since increasing s_1 does not affect the agent's effort level or continuation decision and strictly reduces the principal's payoff from those agents who would have participated anyway. Similarly, s_2 is paid only if it can help the firm retain some agents that would otherwise have preferred to quit after discovering their ability level (i.e., some of those with $\theta_p < \theta < \theta_a$). Furthermore, the proposition shows that the firm will never raise the salary high enough to retain *all* workers who would have quit otherwise: if the salary s_2 is positive in equilibrium, then there are still some people who quit even though the firm wants them to stay (in equilibrium, $\theta_p < \theta < \theta_a$).

IV. PARTIAL REVELATION

Now suppose that the principal has the option of withholding ability information. The firm can now conceal ability over finite disjoint intervals $\Theta_i \subset R$ for $i \in I$ where I is a finite set and Θ_i's are disjoint. Call these Θ_i pooling regions, since the firm pools information from all workers with ability $\theta \in \Theta_i$ together. The intervals Θ_i represent evaluation categories often seen in practice. For example, a worker may only know that his ability is "good," where "good" means a rating between 5 to 7 on a scale of 1 to 10. The firm commits to an information structure $\Theta = \{\Theta_i\}_{i \in I}$ for a finite set I at the time the contract is signed (and before ability is observed), such that if $\theta \in \Theta_k$ for some k after it has been observed by the firm, the firm tells the worker that his output lies within Θ_k. In particular, the firm cannot arbitrarily distort information revelation after the evaluation stage by telling the worker that his ability lies within some other interval Θ_j for $j \neq k$. This focuses analysis on the decision to reveal or not reveal information, but does not address the issue of arbitrary bias in disclosure, which has been explored elsewhere (Prendergast and Topel 1996).

Workers are told in which category their ability lies, so they know that $\theta \in \Theta_i$ for some i. The assumption that the Θ_i's are disjoint guarantees that any worker who is told that his ability lies within Θ_i believes that every other worker with ability within Θ_i is told the same thing. Moreover, because workers are risk-neutral and contracts are linear in θ, if they are told that $\theta \in \Theta_i$ for some i, then they will behave as if they had average productivity within the interval $\bar{\theta}_i \equiv E[\theta | \theta \in \Theta_i]$. Figure 1 illustrates the worker's inference of his ability, given an information structure Θ. Outside of the pooling regions the worker is told his true

FIGURE 1
Agent's Inference



productivity, while within each pooling region the worker assumes that he is average. Formally, this is equivalent to a firm revealing a signal that reveals true output outside of Θ and that maps each Θ_i into $\bar{\theta}_i$. However, allowing firms to select the partition Θ instead of a signaling mechanism is closer to performance categories seen in practice.

The contract is now a tuple $\langle s_1, s_2, b, T_p, \Theta \rangle$ where $\Theta \equiv \{\Theta_i\}_{i \in I}$. I assume the agent is constrained by limited liability (LL), so $s_1, s_2, b \geq 0$. Given this contract, the agent responds by choosing actions $\langle T_a, e(\cdot) \rangle$. The principal now has an additional instrument Θ that she will use to extract rents from the agent. In particular, the principal strategically selects Θ to retain agents who would otherwise prefer to leave. Limited liability restricts the contract space and hence reduces surplus. In particular, limited liability guarantees nonnegative wages to the agent, and thus passes positive rents to the agent. Since the principal holds all of the bargaining power and thus receives all of the surplus in the first best, she now withholds information to take back those rents from the agent on the retention margin.

The agent's effort function $e(\cdot)$ must be constant over each pooling interval Θ_i, since the agent cannot condition on information he does not have. Call this the Measurability Constraint (MC):

$$e(\theta) = \hat{e}_i \quad \forall \theta \in \Theta_i \quad \forall i \in I, \tag{MC}$$

where $\hat{e}_i \in R$ is the level of the function over Θ_i. Recall that the agent is told not just that $\theta \in \Theta$ but that $\theta \in \Theta_i$ for some i. Even though the agent is paid according to θ, he selects his effort with (possibly) imperfect information on θ. This has real productivity consequences for the firm, since the agent's effort choice determines output q. Pooling will affect the agent's effort choice, and, hence, affect the firm's revenue $(V - b)q - s_2 - s_1$.

Figure 2 presents the timeline of the game under partial revelation. At the outset, the principal proposes a contract $\langle T_p, s_1, s_2, b, \Theta \rangle$, which the agent accepts or rejects. If the agent rejects, then the principal and the agent get payoffs $\bar{u}_1^p$ and $\bar{u}_1^a$, respectively. Then, if the agent accepts, then θ is realized. Only the principal observes θ. If $\theta \in \Theta_i$ for some i, then the principal reveals Θ_i. Otherwise, the principal reveals θ. In the actual production stage, the agent decides to stay or leave. If he leaves, then the agent gets $\bar{u}_2^a$ while the

FIGURE 2
Timeline

Evaluation Stage

Principal proposes contract $\langle T_p, s_1, s_2, b, \Theta \rangle$.	Agent accepts/rejects the contract.	θ is realized (only principal observes it).	Principal reveals θ according to Θ.	

Production Stage

Agent stays/leaves.	Agent selects $e(\theta)$ s.t. (MC).	ε is realized. $q = \theta e(\theta) + \varepsilon$.	Agent gets $s_1 + s_2 + bq$.	Principal gets $(V - b)q - s_1 - s_2$.

principal gets $\bar{u}_2^p$. If he stays, then the agent selects effort $e(\theta)$ subject to (MC). So the agent selects $\hat{e}_i$ for all $\theta \in \Theta_i$. Next, ε is realized, and $q = \theta_i \hat{e}_i + \varepsilon$ if $\theta \in \Theta_i$, while $q = \theta e(\theta) + \varepsilon$ otherwise. Finally, the principal receives profit $(V - b)q - s_1 - s_2$ and pays the agent $s_1 + s_2 + bq$.

The principal and agent maximize the same objective functions as before, subject to the additional measurability constraint. Let $\hat{e}(\cdot)$ denote the optimal effort function solving this program. Now we can use the agent's problem to arrive at the shape of the effort function.

Proposition 5: The effort function $\hat{e}(\theta)$ is constant over each Θ_i and increasing elsewhere. In particular $\hat{e}(\theta) = e(E_\theta[\theta | \theta \in \Theta_i])$ for all $\theta \in \Theta_i$ for each $i \in I$.

The shape of the effort function determines the shape of the principal's (and agent's) payoff functions. Let $\hat{u}$ and $\hat{\pi}$ denote the agent's and principal's equilibrium continuation payoffs, respectively, under partial revelation. These payoffs are identical with the full revelation payoffs u and π outside of the pooling regions. But over the pooling regions, these payoffs are a function of e from (MC), so:

$$\hat{u}(\theta) = \begin{cases} b[\theta e(\bar{\theta}_i) + m] - C(e(\bar{\theta}_i)) + s_2 & \text{if } \theta \in \Theta_i \text{ for some } i \\ b[\theta e(\theta) + m] - C(e(\theta)) + s_2 & \text{otherwise} \end{cases}$$

where $\bar{\theta}_i = E_\theta[\theta | \theta \in \Theta_i]$ is the conditional mean of θ over the interval Θ_i. The principal's payoffs depend on the actual value θ and on the effort level, which depends on whether $\theta \in \Theta_i$ for some i:

$$\pi(\theta) = \begin{cases} (V - b)[\theta e(\bar{\theta}_i) + m] - s_2 & \text{if } \theta \in \Theta_i \text{ for some } i \\ (V - b)[\theta e(\theta) + m] - s_2 & \text{otherwise.} \end{cases}$$

Solving the principal's and agent's programs gives the shape of these payoff functions.

Proposition 6: The agent's payoff $\hat{u}(\theta)$ and the principal's payoff $\hat{\pi}(\theta)$ are both upper-semicontinuous, linear over each Θ_i and increasing and convex elsewhere. Both the agent and the principal adopt cutoff strategies for separation.

Convexity for $\hat{u}$ and $\hat{\pi}$ fails because of the discontinuity. Nevertheless, monotonicity is preserved for both functions. The proposition establishes similar properties as the full revelation case, except that now it is necessary to deal with the discontinuities in the functions from the Measurability Constraint. In particular, the separation rule still holds. The agent continues if and only if $\theta > \theta_a$ (or $\bar{\theta}_i > \theta_a$ if $\theta \in \Theta_i$), and the principal continues if and only if $\theta > \theta_p$ (or $\bar{\theta}_i > \theta_p$ if $\theta \in \Theta_i$).

Suppose the principal cannot commit to a revelation scheme. So even if the principal claims to reveal output *ex ante*, she can always reverse this decision *ex post*. Then:

Proposition 7: Without commitment, any pooling region unravels.

This holds because π is increasing. Suppose the principal claims to withhold information by pooling ability over an interval $\Theta_i = [x,y)$. Let $\bar{\theta} = E_\theta[\theta|\underline{\theta} \in [x,y)]$ be average ability over this region. The agent chooses average effort $e = e(\bar{\theta})$ over this region, and the principal earns average profit $\hat{\pi}(\theta) = (V - b)[\theta\, e(\bar{\theta}) + m] - s_2$. But if the principal observes $\theta > \theta$, then she can get $\pi(\theta) > \hat{\pi}(\theta)$ if she reveals it. Since she has no commitment, she will do so. So she, in fact, will only pool over $[x,\bar{\theta})$ and separate over $[\bar{\theta},y)$. Applying this same argument with the candidate pooling interval $[x,\bar{\theta})$ shows that the principal pools below the average of this interval, but separates above it. Repeating this argument *ad infinitum*, the pooling region unravels. See the Appendix for the full formal proof. Therefore the interesting case is when the principal can commit to a revelation strategy. I assume this in what follows.

Intermediate Targets

Recall that the residual surplus $\bar{u}_2 = \bar{u}_2^a + \bar{u}_2^p$ is the sum of the principal's and agent's outside options and represents the value to both parties of abandoning work after the evaluation stage. The logic behind the pooling equilibrium stems from two sequential results. First, the distribution of the residual surplus between the principal and agent determines the ranking of their productivity targets θ_p and θ_a, respectively. How the two parties split the residual surplus $\bar{u}_2$ determines their termination decisions. Second, the ranking of the targets determines whether the principal has an incentive to pool ability. More precisely, if there exists a region in which the principal wants to keep the agent but the agent wants to leave, then the principal will withhold information (pool ability) to retain the agent.

Definition 1: Let $\gamma \equiv \bar{u}_2^a/\bar{u}_2$ denote the agent's share of the residual surplus $\bar{u}_2$.

Because outside options satisfy $\bar{u}_t = \bar{u}_t^a + \bar{u}_t^p$, it is clear that $\gamma \in [0,1]$. High γ means the agent captures most of the residual surplus after a failed project, so γ is one measure of the distribution of residual surplus between the two parties. The distribution of residual surplus determines the ordering of the targets in a clean and intuitive way:

Proposition 8: For each $\bar{u}_2$, there exist $\gamma_1^*(\bar{u}_2)$, $\gamma_2^*(\bar{u}_2) \in (0,1)$ such that if $\gamma > \gamma_1^*(\bar{u}_2)$, then $\theta_a > \theta^* > \theta_p$. If $\gamma < \gamma_2^*(\bar{u}_2)$, then $\theta_a < \theta^* < \theta_p$.

In words, the party who receives most of the residual surplus will set an inefficiently high target, while the other party will set an inefficiently low target. For example, suppose that $\gamma > \gamma_1^*(\bar{u}_2)$, so the agent receives most of the residual surplus. This means his outside option is high (relative to the principal), and, hence, the revealed ability must also be high in order to justify forgoing these attractive outside opportunities. He will tolerate fewer failures, since his alternatives are good, and he therefore sets a high-ability hurdle θ_a. In fact, he quits some projects that are efficient to continue, and so he sets $\theta_a > \theta^*$. Simultaneously the principal receives a small share of the residual surplus and has low outside options relative to the agent. Thus, the agent does not require a high hurdle rate to justify continuation, since her alternatives outside are weak. So she sets a low-ability hurdle, and even continues some projects that are efficient to quit, so $\theta_p < \theta^*$. Similar logic holds if $\gamma < \gamma_2^*$. This result suggests that there will be two classes of equilibria. The distribution of residual surplus will determine whether the equilibrium is separating or pooling.

V. MAIN RESULT

To build intuition behind when the principal will pool and when she will separate, first note that in general pooling is costly. To see this, suppose the principal pools over an interval Θ_i. Let $\bar{\theta}_i = E_\theta[\theta|\theta \in \Theta_i]$ be the average value over the pool. If she reveals θ, then the principal earns $\pi(\theta) = (V - b)(\theta e(\theta) + m) - s_2$, where $e(\theta)$ solves $C'(e(\theta)) = b\theta$. If she pools, she earns $\hat{\pi}(\theta) = (V - b)(\theta e(\bar{\theta}) + m) - s_2$. Since π is convex over Θ_i, Jensen's inequality shows that:

$$E_\theta[\pi(\theta)|\theta \in \Theta_i] > \pi(E_\theta[\theta|\theta \in \Theta_i]) = \pi(\bar{\theta}_i) = \hat{\pi}(\bar{\theta}_i) = E_\theta[\hat{\pi}(\theta)|\theta \in \Theta_i].$$

The last equality holds since $\hat{\pi}$ is linear. Multiply both sides by $1/Pr(\Theta_i)$:

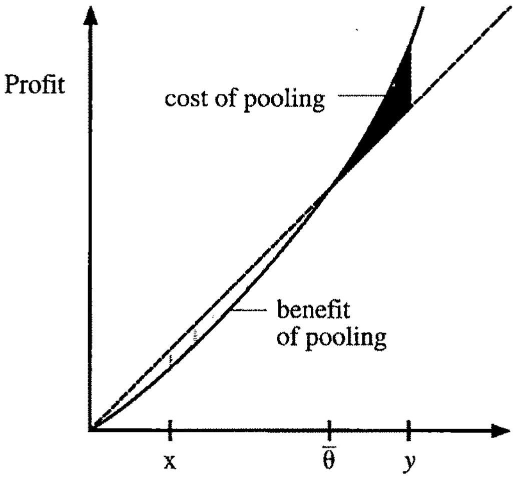
$$\int_{\Theta_i} \pi(\theta)f(\theta)d\theta > \int_{\Theta_i} \hat{\pi}(\theta)f(\theta)d\theta.$$

Hence, revealing earns more profit for the principal than pooling.

Intuitively, the principal reports only the average ability $\bar{\theta}_i = E_\theta[\theta|\theta \in \Theta]$ to everyone in the pool, and the agent chooses effort based on this report. In particular, if an agent produces $\theta > \bar{\theta}_i$, instead of choosing $e(\theta)$, as he would if he knew θ, he chooses $e(\bar{\theta}_i) < e(\theta)$, since the effort function $e(\cdot)$ is increasing. So the stars (those with $\theta > \bar{\theta}_i$) slack off and the slugs ($\theta < \bar{\theta}_i$) work harder, since both think that they are average. Profits are increasing in effort, so the principal loses money on the stars and gains on the slugs. But because the profit function is convex, the loss exceeds the gain. The principal makes so much money off the stars that the cost of telling them that they are average exceeds the benefit of telling the slugs that they are average. It is important to note the reliance on the complementarity of ability and effort. Because of this complementarity, the effort function is increasing and concave in θ, so the principal's profit function is increasing and convex, which permits the use of Jensen's inequality. So complementarity implies that the loss in output from the stars exceeds the gain in output from the slugs. This is illustrated in Figure 3, where the convex and linear dashed lines are the principal's payoffs under separating and pooling, respectively.

Therefore, because pooling is costly, the principal will never pool if she gains nothing from it. Suppose the principal receives most of the residual surplus: $\gamma < \gamma_2^*(\bar{u}_2)$. By Proposition 8, the principal sets a higher target than the agent, so $\theta_p > \theta^* > \theta_a$. If $\theta < \theta_a < \theta_p$, then both parties want the agent to quit, so there is no conflict of interest. The principal

FIGURE 3
Costs and Benefits of Pooling



can fire the agent, or, equivalently, simply reveal θ to the agent and he will quit on his own (since $\theta < \theta_a$). If $\theta > \theta_p$, then the principal wants to retain the agent, and since $\theta_p > \theta_a$, the agent also wants to stay, so again there is no conflict of interest. By the Jensen inequality argument above, pooling is costly and yields no additional benefits to the principal. So the principal will reveal θ to the agent and he will choose to stay. If ability lies at either extreme ($\theta < \theta_a < \theta_p$ or $\theta > \theta_p > \theta_a$), then the interests of both parties are aligned.

Now if $\theta \in (\theta_a,\theta_p)$, then the principal wishes to fire the agent, while the agent wishes to stay. This represents a conflict of interest. In at-will employment contracts, both parties are free to leave at any time, and so ability must clear $\max\{\theta_a, \theta_p\}$ to justify continuation. If $\theta_a < \theta_p$, then $\theta_p = \max\{\theta_a, \theta_p\}$ is the relevant hurdle. Ability fails this hurdle if $\theta_a < \theta < \theta_p$, so the principal can implement her optimal termination decision by firing the agent. Note that simply revealing θ is not sufficient (as it was earlier) because of the conflict of interest; the principal must fire the agent. Thus the principal fires if $\theta < \theta_p$ and fully reveals ability otherwise. Her payoffs are given by $\max\{\pi(\theta),\bar{u}_2^p\}$. In sum, if the principal receives most of the residual surplus, then she sets a higher ability target than the agent, and, hence, can implement her optimal termination rule without resorting to pooling.

Life is different if the tables are turned. Now suppose that the agent receives most of the residual surplus: $\gamma > \gamma_1^*(\bar{u}_2)$. By Proposition 8, the agent sets a higher target than the principal, so $\theta_a > \theta^* > \theta_p$. As before, there is alignment of interest if ability is extreme but conflict of interest otherwise. If ability is very low ($\theta < \theta_p < \theta_a$), then both parties prefer separation. The principal fires the agent, or equivalently reveals θ and the agent leaves on his own. If ability is very high ($\theta > \theta_a > \theta_p$), then both parties prefer continuation. The principal reveals θ and the agent chooses to stay. By Jensen's inequality, pooling is costly and yields no benefits to the principal.

If $\theta \in (\theta_p,\theta_a)$, the agent prefers to quit, but the principal prefers him to stay. If the principal reveals θ, then the agent will quit, leading to a suboptimal outcome for the principal. The key insight is that the principal can retain the worker by withholding information. More precisely, the principal will pool over a large enough region such that the average ability level within the pool satisfies $\bar{\theta} \geq \theta_a$. This ensures that the agent will stay on the job if he is told that he is average. Above this pooling interval, the principal will separate because pooling is costly (by Jensen's inequality). The principal pools as little as possible, only enough to keep workers on the job.

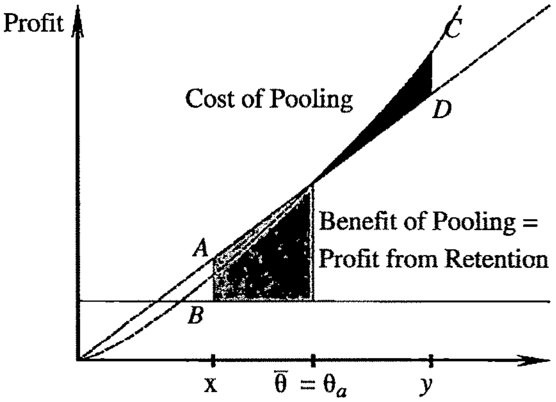
This profit is large enough that the benefits of pooling outweigh the costs. So the value of retention overturns the costs of pooling generated by the convex profit function and Jensen's inequality. In sum, the principal fires the worker if ability is sufficiently low, reveals output if it is sufficiently high, and pools if output is in-between. Collecting these results, we arrive at the main theorem. The full proof and construction of equilibrium lies in the Appendix.

Theorem 1: If $\gamma < \gamma_2^*(\bar{u}_2)$, then the principal fully reveals output. If $\gamma > \gamma_1^*(\bar{u}_2)$, then there exists a unique nontrivial pooling interval $\Theta = \{[x,y)\}$such that the principal pools over $[x,y)$ and reveals output otherwise.

Figure 4 illustrates the costs and benefits of pooling with profit from retention. The lightly shaded region beneath the curved dashed line represents the principal's profit from retention. This is the net profit from agents who stay on the job because they believe that they are average. Observe that the principal selects the pooling region $[x,y)$ such that the average member of the pool $\bar{\theta}$ is exactly indifferent between staying and leaving ($\bar{\theta} = \theta_a$). The proof shows that the constraint $\bar{\theta} \geq \theta_a$ binds: pooling is costly and the principal does it only to keep agents between x and θ_a on the job.

The non-contractibility of ability is a critical assumption. If θ were contractible, then the principal would not pool in equilibrium. Instead, he would pay the agents who want to leave just enough to induce them to stay. Formally, if the contract now took the form $(s_t(\theta),b(\theta))$, then the principal would select $s_2(\theta)$ for all $\theta \in (\theta_p,\theta_a)$ to make those agents indifferent between staying and leaving. While this incurs the cost of extra fixed payments for the principal, it has two benefits. First, it retains agents that the principal wants to keep. Second, it does this without distorting incentives, as pooling does. Recall that pooling skews incentives since the stars work less thinking that they are average, resulting in a loss for

FIGURE 4
Profit from Retention



the principal. By adjusting salaries instead, the principal achieves her retention objective without bearing the loss in output from the incentive effect on the stars.

To summarize, if the principal receives most of the residual surplus, then she will adopt a firing rule higher than the agent's quit rule, and she will fully reveal ability to the agent. If the agent receives most of the residual surplus, then the agent's target exceeds the principal's, and so the principal will partially reveal ability to the agent. Precisely, the principal will fully reveal ability if it is sufficiently high or low, and withhold information (pool) if it is in-between. The principal withholds information as a retention mechanism.

VI. ROBUSTNESS

This section shows that the pooling equilibrium in Theorem 1 is robust under more general cost functions, ability-contingent outside options, nonverifiable output, and compensation schemes that are not linear in output. I also show that the model can be extended to a full two-stage model (where production occurs and effort choices are made in both stages).

General Cost Functions

Until now the marginal cost function was log-concave, or $C'''/C'' < C''/C'$. While this is a weak assumption satisfied by almost every cost function ever used in agency models, it is not necessary for the main result.[12] In particular, there still exists a pooling equilibrium such that the principal pools ability in order to retain workers.

> **Proposition 9:** If $\theta_p < \theta_a$, then there exists a unique equilibrium such that the principal pools over a non-trivial pooling region Θ.

The set of pooling intervals Θ consists of all regions over which π is concave, combined with the interval $[x,y)$ defined in Theorem 1. As before, the principal will select x and y such that:

$$E_\theta[\theta|\theta \in [x,y)] = \theta_a.$$

So the principal still pools to retain workers who otherwise would have left. In addition, she pools where it is inherently profitable to do so, i.e., where the profit function is concave. Dropping the assumption that $C'''/C'' < C''/C'$ leaves open the possibility that π may be concave, which enlarges the set of pooling regions. But this will not eliminate the original pooling region $[x,y)$ from Theorem 1. So the retention effects of withholding performance information still hold under general cost functions even though the pooling region may now include intervals other than $[x,y)$.

Contingent Outside Options

In the benchmark model I assumed that the agent's outside options $\bar{u}_2^a$ did not depend on ability θ. This section shows that the main result is robust when the agent's outside options are contingent on θ if a single-crossing property holds. To see this, suppose that the agent now has an outside option *function* $\bar{u}_2^a(\theta)$, which is increasing in θ (assume that the firm's outside options are still independent of θ). This reflects the natural assumption that higher observed ability produces higher outside opportunities for the agent. These outside opportunities can take the form of higher market wages offered to the agent by other firms. Of course, the market's information is only as good as the agent's, so if the firm pools over a region Θ_i, then the outside option will not vary over this region. In other words, the measurability constraint is now:

---

[12] Without assuming $C'''/C'' < C''/C'$, the profit function will still be continuous but may be concave in places. By Jensen's inequality, the principal will pool wherever her profit function is concave, since the gain in output from the slugs exceeds the loss in output from the stars. Wherever the profit function is concave, the benefits of pooling outweigh the costs, and so the principal will pool.

$$\hat{e}(\theta) = \hat{e}_i \text{ and } \hat{\bar{u}}_2^a(\theta) = \hat{\bar{u}}_1^a \quad \forall\theta \in \Theta_i \quad \forall i \in I \tag{MC$'$}$$

Therefore, the effort function and the outside option function will only vary on the information that the firm reveals to both the agent and the market.

The agent's problem under full revelation is now:

$$\max_{T_a, e(\cdot)} \int_T u(\theta)f(\theta)d\theta + \int_{T^C} \bar{u}_2^a(\theta)f(\theta)d\theta - C(e(\theta)) + s_1$$

subject to (PC), (MC$'$), where $T = T_a \cap T_p$, and T_a and T_p are the agent's and the principal's continuation rules, respectively. So if $\theta \notin T$, the agent now earns an outside option $\bar{u}_2^a(\theta)$. The principal's problem is the same as in the benchmark model.

To guarantee that the main result holds under contingent outside options, we need two relatively weak additional assumptions. The first is a single-crossing property on the agent's outside option function and the agent's equilibrium payoff function, and the second requires that the market's expectations of ability given a pooled estimate be unbiased. If these properties are satisfied, then a form of Theorem 1 still holds.

Proposition 10: Suppose that:

1. there exists a unique θ_0 such that $\bar{u}_2^a(\theta_0) = u(\theta_0)$ and $\bar{u}_2^a(\theta) > u(\theta)$ if and only if $\theta < \theta_0$; and
2. the market's beliefs are unbiased, $\hat{u}_i^a = E_\theta[\bar{u}_2^a(\theta) | \theta \in \Theta_i]$, for all $i \in I$.

Then there exists a unique pooling interval whenever $T_p \cap (T_a)^C \neq \emptyset$ and no pooling occurs whenever $T_p \cap (T_a)^C = \emptyset$.

The single-crossing property (the first condition) is necessary to ensure that the agent will adopt a cutoff strategy. Observe that in the benchmark model, the outside option function did not vary with respect to θ and the payoff function was convex, so the single-crossing property automatically held. The result above shows that as long as the outside option functions are relatively well behaved, there still exists a unique pooling equilibrium such that the principal withholds information to retain workers. If the single-crossing property failed, then the continuation region would possibly consist of a disjoint union of intervals, and there is no guarantee that the principal would still pool over certain regions. Finally, observe that if the outside options function were weakly concave, then the single-crossing property would hold automatically, as long as $u(0) < \bar{u}_2^a(0)$, i.e., the agent chooses not to continue if $\theta = 0$. This result holds because of the convexity of the payoffs.

Nonverifiable Ability

Ability or performance within a firm can be difficult to verify. For example, when the firm observes the worker's productivity and announces this productivity to the agent, the worker may have no reason to believe the firm's announcement. In general, this opens a Pandora's Box of problems. Without imposing any constraints, reporting the true value of ability will not form an equilibrium. To see this, suppose that the worker believes the firm's report. Then the firm will not truthfully report ability, since it can simply report an ability level higher than true ability. Since the agent's effort is increasing in (the report of) his ability and the principal's profit is increasing in the agent's effort, this will cause the agent to work harder and the principal to earn more profit. Hence, the principal has an incentive to deviate, and truth-telling is not an equilibrium.[13]

Therefore, some form of commitment will be necessary in order to discipline the principal from arbitrarily distorting her report to the agent. In particular, suppose that the principal can commit to a contract on its announcement to the firm. Let $\hat{\theta}$ denote the firm's announcement of the agent's output, and $t(\hat{\theta})$ be a (nonlinear) transfer to the agent. If this transfer function is increasing, then the principal commits to paying more money to agents with higher reported output. Because the firm can commit to this contract, the agent knows that the firm will not throw money away on inflated reports.

Consider the following equilibrium. Fix a contract $\langle \theta_p, s_1, s_2, b, \Theta \rangle$ where $\Theta = \{\Theta_i\}_{i \in I}$. The principal's report to the agent is:

$$\hat{\theta} = \begin{cases} E_\theta[\theta | \theta \in \Theta_i] & \text{if } \theta \in \Theta_i \text{ for some } i \\ \theta & \text{otherwise.} \end{cases} \tag{1}$$

Suppose the agent believes the principal's report. Then at the interim stage the agent maximizes his continuation utility:

$$u(\hat{\theta}) = b(\hat{\theta}e(\hat{\theta}) + m) - C(e(\hat{\theta})) + s_2 + t(\hat{\theta}).$$

So for each $\theta > \tau = \max\{\theta_a, \theta_p\}$ the agent optimizes his effort function point-wise, yielding the F.O.C. $C'(e) = b\hat{\theta}$. This generates the agent's optimal effort, taking his beliefs as given. The agent chooses the same effort function as under verifiable output. The agent's effort function is $e(\hat{\theta})$, where $\hat{\theta}$ is given by Equation (1).

Let $\pi(\hat{\theta},\theta)$ be the principal's profit function when the true output is θ and the announcement is $\hat{\theta}$:

$$\pi(\hat{\theta},\theta) = (V - b)(\theta e(\hat{\theta}) + m) - s_2 - t(\hat{\theta}).$$

The truth-telling condition for the principal is $\theta \in \operatorname{argmax}_{\hat{\theta}}\, \pi(\hat{\theta},\theta)$. Solving this truth-telling condition shows that the optimal transfer satisfies:

$$t'(\theta) = \begin{cases} 0 & \text{if } \theta \in \Theta_i \text{ for some } i \\ (V - b)\theta e'(\theta) & \text{otherwise.} \end{cases} \tag{2}$$

---

[13] Other papers have tackled this issue in different ways. In Prendergast and Topel (1996) the principal disciplines the manager's report with an independent signal of performance, and there will be positive bias in the manager's report in equilibrium. Rajan and Reichelstein (2006) use subjective performance measures to slice up a fixed bonus pool that the firm commits to early in the game.

Observe that the transfer function is independent of the announcement over the pooling region. The next proposition shows that if output is nonverifiable, then it is still possible to sustain the same equilibrium as before with an appropriate transfer function.

Proposition 11: There exists an increasing and convex transfer function such that the principal pools over $\Theta = \{[x,y)\}$ if $\theta_p < \theta_a$.

The convexity of the transfer function comes from the Marginal Condition (2). This convex schedule makes the principal's announcement credible to the agent and sustains the equilibrium. Intuitively, the principal commits to making increasingly large transfers to high-ability workers. This serves as a disciplining force on the principal's announcement; since these transfers are costly, the principal will not arbitrarily distort her announcement. The agent knows this, and hence believes the principal.

Nonlinear Compensation Schemes

So far I have considered only contracts that are linear functions of the final output. While this assumption simplified the analysis, it is still natural to ask how the conclusions would change under more general compensation schemes. Given that it is essentially impossible to obtain precise characterizations of equilibria under completely general compensation schemes, it is unsurprising that there are no straightforward conditions on the primitives of the model that guarantee the existence of a pooling equilibrium in such a general setting. Remarkably, however, it is still possible to show, under fairly weak technical conditions, that the principal will choose to pool ability information to retain workers if, under the optimal contract, there are agents who want to abandon the project even though the principal would like them to stay.

In particular, let the compensation scheme $R: R_+ \rightarrow R_+$ be any continuous and differentiable function of final output.[14] A contract is a pair $\langle T_p, R(\cdot)\rangle$, where T_p is the firing rule (fire if $\theta \notin T_p$) and $R(\cdot)$ is the compensation scheme. Given this contract, the agent responds by choosing actions $\langle T_a, e(\cdot)\rangle$: a quit rule T_a (quit if $\theta \notin T_a$) and an effort function $e(\cdot)$. Let $T = T_a \cap T_p$, so the probability of advancing is $P(T) = \Pr(\theta \in T)$. Conditioning on θ, the agent's and principal's continuation utilities are:

$$u(\theta) = E_\varepsilon R(\theta e(\theta) + \varepsilon) - C(e(\theta))$$
$$\pi(\theta) = V(\theta e(\theta) + m) - E_\varepsilon R(\theta e(\theta) + \varepsilon),$$

where E_ε is the expectation with respect to ε. The agent's and the principal's optimization problems are, respectively:

$$\max_{T_a, e(\cdot)} \int_T u(\theta) f(\theta) d\theta + (1 - P(T))\bar{u}_2^a \text{ and } \max_{T_p, R(\cdot)} \int_T \pi(\theta) f(\theta) d\theta + (1 - P(T))\bar{u}_2^p.$$

Note that this implies that $T_a = \{\theta | u(\theta) \geq \bar{u}_2^a$ and $T_p = \{\theta | \pi(\theta) \geq \bar{u}_2^p\}$.

---

[14] While I allow compensation schemes that are general functions of final output, it is important that they do not directly depend on ability. With ability-contingent compensation schemes, Condition 2 of Proposition 12 would never be satisfied in an equilibrium: it would be profitable for the principal to deviate by paying agents in some neighborhood of θ_a just enough to induce them to stay. I thank an anonymous referee for suggesting closer inspection of ability-contingent compensation contracts.

Without further assumptions on the reward scheme, little else can be said about the equilibrium choices of the agents. In particular, we can no longer conclude that effort is increasing in ability, that payoff functions are increasing and concave, or that either party will adopt a cutoff strategy for termination.[15] Given all this uncertainty, it is remarkable that fairly weak regularity conditions are sufficient to guarantee that the main result still holds: the principal will withhold ability information in order to retain agents.

Proposition 12: Let T_p and T_a be the equilibrium continuation sets under the constraint of full revelation. Suppose the following conditions hold:

1. There exists $\theta_a > 0$ such that $T_a = [\theta_a, \infty)$.
2. $\pi(\theta_a) > \bar{u}_2^p$ and there exists some nontrivial neighborhood of θ_a, N_{θ_a}, such that $N_{\theta_a} \subset T_p$.
3. The function $y{:}(N_{\theta_a} \cap (-\infty,\theta_a]) \rightarrow [\theta_a,\infty)$ given by $y(t) = \inf \{x \geq t | E_\theta[u(\theta)|\theta \in [t,x)] \geq \bar{u}_2^a\}$ is well-defined, continuous and differentiable, and $|y'(\theta_a)| < \infty$.

Then, in the unconstrained equilibrium, there exists a nontrivial pooling interval $\Theta = [\alpha,\beta)$.

Condition 1 says that the agent will be using a cutoff strategy in equilibrium. I show in the proof of the proposition that a sufficient (but not necessary) condition for this is that $R' > 0$. As such, the condition is fairly weak.

Condition 2 is a formalization of the statement that the principal would like to retain some of the agents who choose to quit under full revelation. It also requires that the principal *strictly* prefers the marginal-ability agent θ_a to stay. The condition says that there is some neighborhood of θ_a such that the principal would like agents with ability in this neighborhood to stay on the project. A sufficient (though not necessary) condition for this would be that the principal adopts a cutoff strategy with $\theta_p < \theta_a$. In this case, $N_{\theta_a} = (\theta_p,\infty)$.

Condition 3 requires that it is possible to retain agents by pooling around θ_a. Given the continuity of $u(\cdot)$ and the fact that $u(\theta_a) > \bar{u}_2^a$, the first part of the condition would hold for most $u(\cdot)$. The second part of the condition is essentially a regularity condition on the distribution of ε and the cost function, requiring that the right endpoint of the minimal pooling interval does not change at an infinite speed as the interval becomes infinitesimal. The simplest example of a function satisfying Condition 3 is the $y(t)$ function under linear contracts, defined implicitly by $y'(t) = [f(t(t - \theta_a)]/[f(y(t))(y(t) - \theta_a)]$.

Under these conditions, it is profitable for the principal to pool ability information around θ_a, by the same logic as in the linear case. At θ_a, the principal's effective payoff function (i.e., payoffs taking into account the continuation decision) is right-continuous and has a positive jump under full revelation. Therefore, by pooling around θ_a, the principal's possible loss due to lower effort exerted by those to the right of θ_a is only second-order, while the gain due to participation by those to the left of θ_a is first-order, much like in Figure 4.

---

[15] Furthermore, since the expectation operator and the compensation function can no longer be exchanged (due to nonlinearity), previous arguments based on Jensen's inequality no longer hold, and it is also no longer the case that agents who are told their ability is in some Θ_i will choose their effort as if their ability were average within the interval $(\bar{\theta}_i)$.

Two-Stage Production

So far I have assumed that θ is an exogenously given ability parameter. In this subsection I extend the model to a setup where θ is first-stage output that can be influenced by the agent's choice of effort. I show that under certain conditions pooling occurs also in this setting.

Now the agent works on the project over two stages (as opposed to the main model, where the first stage was merely an evaluation period). Effort e_t is exerted in each stage $t = 1, 2$ at cost $C(e_t)$, where C' and C'' are positive. As before, both the agent and the principal are risk-neutral and there is no discounting. In each stage, the agent produces output $q_t = e_t + \varepsilon_t$. The noise terms $\varepsilon_t \in [0,\infty)$ are independently and identically distributed (i.i.d.), and distributed around a mean of m, with cdf $G(\cdot)$ and density function $g(\cdot)$. The agent observes his effort but the firm does not. Output q_t is noncontractible, but final output $q = q_1q_2$ is contractible. The firm captures value Vq from the project. Each q_t represents stage t output, while Vq measures total project value. Thus, q_t is the project's *internal* output within the firm used for planning and evaluation purposes, while Vq measures the project's *external* value based on market prices. A good example of a production function that fits this framework is a multistage project with an initial research and development component.

After the production stage, output (q_1, q_2) is observable to both parties, but only the firm observes q_1 after the first stage. The firm can choose to reveal q_1 to the agent or not. Once revealed, performance information is *ex post* verifiable by the agent. The principal's and the agents' outside options in stage t are $\bar{u}_t^a$ and $\bar{u}_t^p$, respectively. As before, the residual surplus is defined as $\bar{u}_2 = \bar{u}_2^a + \bar{u}_2^p$ and the principal and agent must satisfy a participation constraint (PC) that their equilibrium payoffs must exceed $\bar{u}_1^p + \bar{u}_2^p$ and $\bar{u}_1^a + \bar{u}_2^a$, respectively.

Similar to the nonlinear extension of the main model, let the compensation scheme $R(q){:}R_+ \rightarrow R_+$ be any continuous and differentiable function of final output. A contract is a pair $\langle T_p, R(\cdot)\rangle$, where T_p is the firing rule (fire if $q_1 \notin T_p$) and $R(\cdot)$ is the compensation scheme. Given this contract, the agent responds by choosing actions $\langle T_a, e_1, e_2(\cdot)\rangle$: a quit rule T_a (quit if $q_1 \notin T_a$), first-stage effort e_1, and second-stage effort function $e_2(\cdot)$. Let $T = T_a \cap T_p$. The probability of advancing is $P(T) = \Pr(q_1 \in T|e_1)$. Conditioning on q_1, the agent's and principal's continuation utilities are:

$$u(q_1) = E_2R(q_1(e_2(q_1) + \varepsilon_2)) - C(e_2(q_1))$$
$$\pi(q_1) = Vq_1(e_2(q_1) + m) - E_2R(q_1(e_2(q_1) + \varepsilon)),$$

where E_2 is the expectation with respect to ε_2. The agent's and the principal's optimization problems are, respectively:

$$\max_{T_a, e_1, e_2(\cdot)} \int_T u(q_1)g(q_1 - e_1)dq_1 + (1 - P(T))\bar{u}_2^a + s_1$$
$$\max_{T_p, R(\cdot)} \int_T \pi(q_1)g(q_1 - e_1)dq_1 + (1 - P(T))\bar{u}_2^p - s_1.$$

Note that this implies that $T_a = \{q_1|u(q_1) \geq \bar{u}_2^a\}$ and $T_p = \{q_1|\pi(q_1) \geq \bar{u}_2^p\}$.

Proposition 13: Let T_p and T_a be the equilibrium continuation sets under the constraint of full revelation. Suppose the following conditions hold:

1. There exist $q_a > 0$ and $q_p > 0$ such that $T_a = [q_a, \infty)$ and $T_p = [q_p, \infty)$, and $q_p < q_a$. Furthermore, $\pi'(q_1) > 0$, for all $q_1 > 0$.
2. The function $y: (q_p, q_a] \rightarrow [q_a, \infty)$ given by $y(t) = \inf\{x \geq t | E[u(q_1) | q_1 \in [t,x)] \geq \bar{u}_2^a\}$ is well-defined, continuous, and differentiable, and $|y'(q_a)| < \infty$.
3. The function $e_1(t)$ that gives the optimal stage-one effort as a function of the pooling interval $[t, y(t))$ satisfies $e'_1(q_a) \leq 0$.

Then, there will be a non-trivial pooling interval $Q = [t, y(t))$.

The conditions for this proposition are similar to those in Proposition 12 except we now require that *both* agents use cutoff strategies, and we have added an additional condition that deals with the effect of pooling on first-stage effort. In this case, pooling can affect payoffs even off the pooling interval, since pooling can cause the agent to adjust his first-stage effort. This complication was absent from the single-stage model, since ability was given exogenously. The last condition says that pooling on an infinitesimal interval around q_a will not decrease the first-stage effort. Without this, we would not be able to reach the same result, because pooling could then negatively affect first-stage effort and, thus, payoffs both on and off the pooling region. Consequently, the gains from pooling could be annihilated.

Note that the proof of Proposition 13 does not depend on the assumption that outside options are independent of the level of first-stage output. Therefore, the result automatically extends to the case when the principal's and the agent's outside options are increasing functions of first-stage output, $\bar{u}_2^a(q_1)$ and $\bar{u}_2^p(q_1)$, respectively. That is, a more-productive early stage produces higher outside opportunities for the firm and the agent. Since Conditions 1 and 2 of the proposition depend on the forms of the outside options functions, $E[u(q_1) | q_1 \in [t,x)] \geq \bar{u}_2^a$ from Condition 2 becomes $E[u(q_1) - \bar{u}_2^a(q_1) | q_1 \in [t,x)] \geq 0$.

It turns out that in the special case of linear contracts of the form $\langle b, s_1, s_2 \rangle$ (and constant outside options), as considered in the central part of this paper, the conditions of the proposition hold whenever $q_a > q_p$. Furthermore, Proposition 8 still holds, so $q_a > q_p$ whenever the agent receives a sufficiently large fraction of the residual surplus.[16]

VII. CONCLUSION

The compensation and management literature has extensively documented that firms withhold performance evaluation information from employees. Most studies cite psychological and political reasons for withholding performance evaluation information. Managers do not wish to depress morale in the workplace, and as Bjerke et al. (1987) found upon interviewing Navy officers, there are in fact psychological incentives for supervisors to withhold performance evaluation information, primarily to secure esteem-building promotions for junior officers. Managers also withhold information to avoid complicated interfirm politics, as noted by Mitchell and O'Reilly (1983). When possible, managers deter tension and animosity between managers and subordinates as well as among subordinates.

This paper advances an economic theory based on strategic retention. The key ingredients in the model here are complementarity in production (between ability and output) and outside options at the interim stage. These assumptions show that in equilibrium, the firm pools workers together if their output is mediocre and reveals performance if their output is at either extreme. The size of the pooling interval trades off the benefits of pooling from retention against the cost of pooling from lost output. As such, this paper offers an economic explanation of a phenomenon that was previously justified on psychological and political grounds.

---

[16] Details and a formal proof are available from the author on request.

APPENDIX

Proof of Proposition 1

By pooling, the planner must restrict effort functions to be constant over pooled regions. Therefore by not pooling, the planner maximizes over a larger set (all real-valued functions), and is therefore (weakly) better off. ■

Proof of Proposition 2

Let $X \equiv \{\theta : S(\theta) > \bar{u}_2\}$ be the social planner's continuation set: it is efficient to allow a worker with ability θ to work on the project if and only if $\theta \in X$. Let $P = \Pr(X)$. I will show that X is in fact an interval. Continuation surplus is:

$$S(\theta) = \max_{e(\theta)}\{EV(\theta e + \varepsilon) - C(e)\} = \max_{e(\theta)}\{V(\theta e(\theta) + m) - C(e(\theta))\}.$$

Note that the F.O.C. for the optimal choice of $e(\theta)$ is $V\theta = C'(e(\theta))$. Since $V\theta > V \cdot 0 = 0 = C'(0)$ and C' is increasing, we know that $e(\theta) > 0$. Also note that the F.O.C. implies that $\lim_{\theta\to\infty} e(\theta) = \infty$ and $\lim_{\theta\to 0} e(\theta) = 0$.

Now, by the envelope theorem, $S'(\theta) = Ve(\theta) > 0$, so that $S(\cdot)$ is strictly increasing. Furthermore, $S(\cdot)$ is continuous, and $\lim_{\theta\to\infty} S(\theta) = \infty$ and $\lim_{\theta\to 0} S(\theta) = Vm - C(0) < Vm < \bar{u}_2$. Therefore, the intermediate value theorem implies that there exists θ^* such that $S(\theta^*) = \bar{u}_2$. Since $S(\cdot)$ is strictly increasing, this implies that $S(\theta) \geq \bar{u}_2$ if and only if $\theta > \theta^*$. That is, $X = [\theta^*, \infty)$. ■

Proof of Proposition 3

The agent solves:

$$\max_{T_a, e(\cdot)} \int_T u(\theta)f(\theta)d\theta + (1 - P(T))\bar{u}_2^a + s_1 \text{ subject to (PC)}$$

where $P(T) = \Pr(\theta \in T)$ and $u(\theta) = b(\theta e(\theta) + m) + s_2 - C(e(\theta))$.

For now, let us assume that $0 < b < V$; I will show later in this proof that this will indeed be the case under the optimal contract. Let $\langle e^*(\cdot), T_a^*\rangle$ denote the optimal values. Note that $T_a^* = \{\theta | u(\theta) > \bar{u}_2^a\}$.

The F.O.C. with regard to $e(\cdot)$ gives $C'(e^*(\theta)) = b\theta$ for all $\theta > \tau$. Hence e^* is a function of both θ and b, so write $e^*(\theta,b)$. By the implicit function theorem:

$$\frac{\partial e^*}{\partial \theta}(\theta,b) = \frac{b}{C''(e^*)} > 0 \quad \text{and} \quad \frac{\partial e^*}{\partial b}(\theta,b) = \frac{\theta}{C''(e^*)} > 0.$$

So for any $b > 0$, $e^*(\cdot)$ is increasing in b and θ.

Finally, note that the F.O.C. implies that $e^*(\theta) > 0$: $C'(e(\theta)) = b\theta > 0 = C'(0)$.

Agent's Payoffs

Let $u(\theta,b)$ be the agent's payoff function under the optimal choice of effort. Note that $u(\cdot,\cdot)$ is continuous in both arguments. Furthermore, for any $b > 0$, $u(\cdot,b)$ is an increasing and convex function of θ, since, by the implicit function theorem and the F.O.C.:

$$\frac{\partial u}{\partial \theta}(\theta,b) = be^*(\theta) > 0 \quad \text{and} \quad \frac{\partial^2 u}{(\partial \theta)^2}(\theta,b) = b\frac{\partial e^*}{\partial \theta}(\theta,b) > 0.$$

On the other hand, for any $\theta > 0$, $u(\theta,\cdot)$ is an increasing function of b, since, again by the implicit function theorem and the F.O.C.:

$$\frac{\partial u}{\partial b}(\theta,b) = \theta e^*(\theta,b) + m > 0.$$

Continuity, monotonicity, and convexity of u w.r.t. θ imply the existence of a cutoff strategy, as an application of the intermediate value theorem. In fact, for any $b > 0$, $\lim_{\theta \downarrow 0} u(\theta,b) = bm - C(0) + s_2$ and $\lim_{\theta \uparrow \infty} u(\theta,b) = \infty$.

If $bm - C(0) + s_2 \geq \bar{u}_2^a$, then, since u is increasing in θ, we know that $u(\theta,b) \geq \bar{u}_2^a$ for all θ, so the agent always chooses to work on the project. That is, $T_a = [0,\infty)$. However, Proposition 4 will show that this is not possible in equilibrium.

If $bm - C(0) + s_2 < \bar{u}_2^a$, then the results above imply that there exist two points x, y such that $0 < x < y$ and $u(x,b) < \bar{u}_2^a < u(y,b)$. Therefore, by continuity and monotonicity, there exists a unique $\theta_a(b) > 0$ such that $u(\theta,b) \geq \bar{u}_2^a$ if and only if $\theta \geq \theta_a(b)$. Such a $\theta_a(b;\bar{u}_2^a)$ corresponds to the agent's optimal quit rule and satisfies the marginal condition $u(\theta_a(b;\bar{u}_2^a),b) = \bar{u}_2^a$. Consequently, $T_a = [\theta_a(b;\bar{u}_2^a),\infty)$. Notice that $\theta_a(\cdot;\bar{u}_2^a)$ is decreasing in b, since by the implicit function theorem and the F.O.C.:

$$\frac{\partial \theta_a}{\partial b}(b;\bar{u}_2^a) = -\frac{\theta_a(b;\bar{u}_2^a)e(\theta_a(b;\bar{u}_2^a)) + m}{be(\theta_a(b;\bar{u}_2^a))} < 0.$$

Similar calculations show that $\theta_a(b;\cdot)$ is an increasing and concave function of $\bar{u}_2^a$.

Principal's Payoffs

Let $\pi(\theta,b) \equiv (V - b)(\theta e(\theta) + m) - s_2$. For any $b > 0$, $\pi(\cdot,b)$ is a continuous and measurable function. This function is increasing in θ, since:

$$\frac{\partial \pi}{\partial \theta}(\theta,b) = (V - b)\left(e(\theta,b) + \theta\frac{\partial e}{\partial \theta}(\theta,b)\right) > 0.$$

Furthermore, under our assumptions on $C(\cdot)$, $\pi(\theta,b)$ is convex in θ for all $b > 0$:

$$\frac{\partial^2\pi}{(\partial\theta)^2}(\theta,b) = (V-b)\left(2\frac{\partial e}{\partial\theta}(\theta,b) + \theta\frac{\partial^2 e}{\partial\theta^2}(\theta,b)\right),$$

$$\frac{\partial^2\pi}{(\partial\theta)^2}(\theta,b) > 0 \Longleftrightarrow 2\frac{\partial e}{\partial\theta}(\theta,b) + \theta\frac{\partial^2 e}{(\partial\theta)^2}(\theta,b) > 0$$

$$\Longleftrightarrow -\frac{\theta\dfrac{\partial^2 e}{(\partial\theta)^2}(\theta,b)}{\dfrac{\partial e}{\partial\theta}(\theta,b)} < 2.$$

By the F.O.C. and the implicit function theorem:

$$-\frac{\theta\dfrac{\partial^2 e}{(\partial\theta)^2}(\theta,b)}{\dfrac{\partial e}{\partial\theta}(\theta,b)} = \frac{C'(e(\theta,b))C'''(e(\theta,b))}{(C''(e(\theta,b)))^2}.$$

Recall that $C'''/C'' < C''/C'$. Thus, the term in the right-hand side is less than 1, and hence, *a fortiori*, less than 2. Therefore, $\frac{\partial^2\pi}{(\partial\theta)^2}(\theta,b) > 0$.

Since π is increasing and convex in θ, we know that $\lim_{\theta\to\infty}\pi(\theta,b) = \infty$. Since $e(0) = 0$, $\lim_{\theta\to 0}\pi(\theta,b) = (V-b)m - s_2 < Vm < \bar{u}_2^p$. Thus, by continuity and the intermediate value theorem, there exists $\theta_p(b;\bar{u}_2^p)$ such that $\pi(\theta_p(b;\bar{u}_2^p),b) = \bar{u}_2^p$. Since π is strictly increasing in θ, this $\theta_p(b;\bar{u}_2^p)$ is unique, and $\pi(\theta,b) \geq \bar{u}_2^p$ if and only if $\theta \geq \theta_p(b;\bar{u}_2^p)$. Thus $T_p = [\theta_p(b;\bar{u}_2^p),\infty)$, so the principal will employ a cutoff strategy. Straight computation yields $\frac{\partial\theta_p}{\partial\bar{u}_2^p}(b;\bar{u}_2^p) > 0$ and $\frac{\partial^2\theta_p}{(\partial\bar{u}_1^p)^2}(b;\bar{u}_2^p) < 0$. Thus $\theta_p(b;\cdot)$ is an increasing and concave function of $\bar{u}_2^p$.

The Equilibrium Choice of b

It was assumed above that $0 < b < V$. I will now show that the principal will never choose $b = 0$ or $b = V$. First note that the results obtained under the assumption $0 < b < V$ showed that for each such value of b there exists an ability level $\tilde{\theta}(b) = \max\{\theta_p(b),\theta_a(b)\}$ such that for all $\theta > \tilde{\theta}$ we have $\pi(\theta) > \bar{u}_p^2$ and $u(\theta) > \bar{u}_a^2$. As long as these values occur with positive probability (a sufficient condition for this would be that $f(\theta) > 0$ for all $\theta > 0$), the expected profit to the principal under *any* $b \in (0,V)$ is greater than $\bar{u}_2^p$.

On the other hand, if the principal chooses $b = V$, then her continuation payoff for any ability level θ is $-s_2 \leq 0 < \bar{u}_p^2$. Thus, the principal always terminates the project and her expected profit is $\bar{u}_2^p$, which is strictly less than the profit she would have obtained by adopting *any* $b \in (0,V)$. Therefore, $b = V$ is never chosen.

Similarly, if the principal chooses $b = 0$, then we know from the first-order condition of the agent that she will choose $e(\theta,0) = 0$ for any θ. As a result, the principal's continuation payoff will be $Vm - s_2 \leq Vm < \bar{u}_2^p$, and she will again choose to terminate. Thus, her expected profit in this case is again only $\bar{u}_2^p$, so that this choice is strictly dominated by any $b \in (0,V)$. Consequently, $b = 0$ is never chosen. ■

Proof of Proposition 4

Note that s_1 does not affect the agent's choice of effort and, since it is paid regardless of the continuation decision, it also does not influence the termination rules. Hence, it has only a direct effect on the principal's and the agent's payoffs, strictly decreasing the former and increasing the latter, given that the agent does accept the contract. Thus, the only case in which the principal would choose to pay $s_1 > 0$ would be if this were necessary to satisfy the agent's participation constraint, i.e., to induce the agent to enter the contractual relationship. By the same reason, it is also clear that the principal will never raise the salary above the level at which the agent's participation constraint just binds.

As for the second part of the proposition, suppose there is an equilibrium in which $s_2 > 0$ and $\theta_p \geq \theta_a$. The principal's objective function is:

$$E\Pi(b,s_1,s_2,\theta_p) = \int_{\theta_p}^{\infty} \pi(\theta)f(\theta)d\theta + F(\theta_p)\bar{u}_2^p - s_1,$$

where $\pi(\theta) = (V - b)(\theta e(\theta) + m) - s_2$. Since we have already observed that s_2 does not affect the effort choice, we know that $\frac{\partial \pi}{\partial s_2} = -1$. Therefore:

$$\frac{\partial}{\partial s_2} E\Pi(b,s_1,s_2,\theta_p) = \int_{\theta_p}^{\infty} \frac{\partial \pi}{\partial s_2}(\theta)f(\theta)d\theta = F(\theta_p) - 1 < 0.$$

Consequently, it is profitable for the principal to decrease s_2 (and this is feasible without violating limited liability, since $s_2 > 0$). This means that the proposed s_2, θ_a, and θ_p cannot be part of an equilibrium. This proves the proposition.

Returning briefly to the agent's problem in selecting θ_a, we can now see that $\theta_a = 0$ will never occur in equilibrium. Recall that $\theta_a = 0$ would occur if and only if $bm - C(0) + s_2 \geq \bar{u}_2^a$. But, since $\theta_p > 0 = \theta_a$, the current proposition implies that $s_2 = 0$. Therefore, $bm - C(0) + s_2 = bm - C(0) < Vm < \bar{u}_2^a$. Contradiction. Consequently, $\theta_a > 0$ and so it must satisfy the condition $u(\theta_a) = \bar{u}_2^a$. ■

Proof of Proposition 5

The agent's continuation payoff is:

$$\hat{u}(\theta) = \begin{cases} b[\theta\hat{e}_i + m] - C(\hat{e}_i) + s_2 & \text{if } \theta \in \Theta_i \text{ for some } i \\ b[\theta e(\theta) + m] - C(e(\theta)) + s_2 & \text{otherwise.} \end{cases}$$

Therefore, under a bonus b, the agent solves $\max_{e(\theta)}\hat{u}(\theta)$.

Outside of the pooling region the agent solves the same problem as in the full revelation case. Thus, we have that the optimal solution is given by the effort function $e(\theta,b)$ from FR, described in Proposition 3.

Within the pooling region, the agent solves a different problem. From (MC) the agent's effort function must be constant over each Θ_i, so he earns $\hat{u}(\theta) = b\theta\hat{e}_i - C(\hat{e}_i) + s_2$ over Θ_i, where $\hat{e}_i$ is the single effort choice over Θ_i. Since the agent's information set is Θ_i, his expected utility is $E_\theta[\hat{u}(\theta)|\Theta_i] = b\bar{\theta}_i\hat{e}_i - C(\hat{e}_i) + s_2$. The F.O.C. shows that for each $i \in I$, $C'(\hat{e}_i) = b\bar{\theta}_i$, defining the optimal effort level on each pooling region. So $C'(\hat{e}_i)$

$= C'(e(\bar{\theta}_i))$, which implies that $\hat{e}_i = e(\bar{\theta}_i)$ where $e(\cdot)$ is the effort function from FR. Combined with Step One, the best response function is defined over the whole domain and is:

$$\hat{e}(\theta,b) = \begin{cases} e(\bar{\theta}_i,b) & \text{if } \theta \in \Theta_i \text{ for some } i \in I \\ e(\theta,b) & \text{otherwise.} \end{cases}$$

This function, although discontinuous at each boundary point of the pooling regions, is a (weakly) increasing function of θ. By Proposition 3, $e(\cdot,b)$ is a strictly increasing function of θ and $\hat{e}(\theta,b)$ is constant over each Θ_i, so it is sufficient to prove that at each discontinuity point the function $\hat{e}(\cdot,b)$ has a positive jump. Formally, by the mean value theorem, for each $i \in I$, $\inf \Theta_i < \bar{\theta}_i < \sup\Theta_i$. Since $e(\cdot,b)$ is continuous and, for each $b > 0$, strictly increasing:

$$\lim_{\theta\uparrow\inf\Theta_i} \hat{e}(\theta,b) = e(\inf \Theta_i,b) < e(\bar{\theta}_i,b) = \lim_{\theta\downarrow\inf\Theta_i} \hat{e}(\theta,b)$$

$$\lim_{\theta\uparrow\sup\Theta_i} \hat{e}(\theta,b) = e(\bar{\theta}_i,b) < e(\sup \Theta_i,b) = \lim_{\theta\downarrow\sup\Theta_i} \hat{e}(\theta,b).$$

Again, monotonicity confirms the idea that the second-stage effort is positively related with the signal. Under the assumption $\Theta_i = [\alpha_i,\beta_i)$ for some $i \in I$, the above computation also shows that $\hat{e}(\cdot,b)$ is an upper-semicontinuous function of θ, since, for all $q \geq 0$, $\limsup_{\theta\to q} \hat{e}(\theta,b) \leq \hat{e}(q,b)$.

By Proposition 3, we also have that the effort level is increasing in b:

$$\frac{\partial \hat{e}}{\partial b}(\theta,b) = \frac{\sigma(\theta)}{C''(\hat{e})} > 0 \quad \text{for } \theta > 0\text{, where}$$

$$\sigma(\theta) = \begin{cases} E_\theta[\theta|\theta \in \Theta_i] & \text{if } \theta \in \Theta_i \text{ for some } i \\ \theta & \text{otherwise.} \end{cases}$$

■

Proof of Proposition 6

Agent's Payoff

The agent's payoff is given by:

$$\hat{u}(\theta) = \begin{cases} b[\theta e(\bar{\theta}_i) + m] - C(e(\bar{\theta}_i)) + s_2 & \text{if } \theta \in \Theta_i \text{ for some } i \\ b[\theta e(\theta) + m] - C(e(\theta)) + s_2 & \text{otherwise} \end{cases}$$

where $\bar{\theta}_i = E_\theta[\theta|\theta \in \Theta_i]$. The function is clearly linear and increasing in θ over each Θ_i. Off the pooling intervals, the function is equal to $u(\theta)$, which we have shown to be increasing and convex in θ. Finally, since $\hat{e}(\theta,b)$ is an upper-semicontinuous, measurable, and weakly increasing function of θ, $\hat{u}(\theta)$ is also upper continuous, measurable, and *strictly* increasing over its entire domain.

It is also obvious that it is optimal for the agent to use a cutoff strategy based on the same cutoff value θ_a that was defined in the full revelation case. Consider two cases:

1. If θ is revealed to the agent, then he should quit if and only if $\bar{u}_2^g > \hat{u}(\theta) = u(\theta)$, which holds if and only if $\theta < \theta_a$, as shown before.

2. If Θ_i is revealed, the agent should quit if and only if $\bar{u}_2^a > E_\theta[\hat{u}(\theta)|\theta \in \Theta_i] = b(\theta_i e(\bar{\theta}_i) + m] - C(e(\bar{\theta}_i)) = u(\bar{\theta}_i)$, which holds if $\bar{\theta}_i < \theta_a$.

Principal's Payoff

The principal's payoff function is:

$$\hat{\pi}(\theta) = \begin{cases} (V - b)[\theta e(\bar{\theta}_i) + m] - s_2 & \text{if } \theta \in \Theta_i \text{ for some } i \\ (V - b)[\theta e(\theta) + m] - s_2 & \text{otherwise.} \end{cases}$$

The function is clearly linear and increasing in θ over each Θ_i. Off the pooling intervals, the function is equal to $\pi(\theta)$, which we have shown to be increasing and convex in θ. Finally, since $\hat{e}(\theta,b)$ is an upper-semicontinuous, measurable, and weakly increasing function of θ, $\hat{\pi}(\theta)$ is also upper continuous, measurable, and *strictly* increasing over its entire domain.

Also, by the same logic as in the agent's case, the principal should terminate the contract if and only if $\sigma(\theta) < \theta_p$, where:

$$\sigma(\theta) = \begin{cases} E_\theta[\theta|\theta \in \Theta_i] & \text{if } \theta \in \Theta_i \text{ for some } i \\ \theta & \text{otherwise.} \end{cases}$$

■

Proof of Proposition 7

Suppose the principal pools over some $\Theta_i = [x,y)$. Construct a sequence of sets F_n such that $F_0 \equiv \Theta_i = [x,y)$, $\bar{\theta}_n = E_\theta[\theta|\theta \in F_n]$, and $F_{n+1} = [x,\bar{\theta}_n)$.

Lemma 1. *If the principal pools over F_n, then without commitment he pools over F_{n+1} and separates over $F_n \backslash F_{n+1}$.*

Proof. (By induction) *Step One.* Her profit over F_0 is the linear function $\hat{\pi}_0(\theta) = (V - b)[\theta e(\bar{\theta}_0) + m] - s_2$ for all $\theta \in F_0$. Since $e(\cdot)$ is increasing, $\pi(\theta) = (V - b)[\theta e(\theta) + m] - s_2 > (V - b)[\theta e(\bar{\theta}_0) + m] - s_2 = \hat{\pi}(\theta)$ for all $\theta > \bar{\theta}_0$. So the principal prefers to reveal θ for all $\theta \in [\bar{\theta}_0,y) = F_0 \backslash F_1$ and pool for all $\theta \in [x,\bar{\theta}_0) = F_1$.

Step n. Her profit over F_n is the linear function $\hat{\pi}_n(\theta) = (V - b)[\theta e(\bar{\theta}_n) + m] - s_2$ for all $\theta \in F_n$. Since $e(\cdot)$ is increasing, $\pi(\theta) = (V - b)[\theta e(\theta) + m] - s_2 > (V - b)[\theta e(\bar{\theta}_n) + m] - s_2 = \hat{\pi}(\theta)$ for all $\theta > \bar{\theta}_n$. So the principal prefers to reveal θ for all $\theta \in [\bar{\theta}_n,y) = F_n \backslash F_{n+1}$ and pool for all $\theta \in [x,\bar{\theta}_n) = F_{n+1}$.

If the principal pools over $F_0 \equiv \Theta_i$, then from the lemma, without commitment the principal pools only over F_{n+1} for each n. But $F_{n+1} \subset F_n$ and $\bar{\theta}_n \rightarrow x$ so $F_n \rightarrow \emptyset$. So the principal does not pool over any interval, and hence not on any finite disjoint union of intervals. So any pooling region Θ unravels. ■

Proof of Proposition 8

Let $\tilde{u}(\theta) = \tilde{b}(\theta e(\theta,\tilde{b}) + m) - C(e(\theta,\tilde{b})) + \tilde{s}_2$ and $\tilde{\pi}(\theta) = (V - \tilde{b})(\theta e(\theta,\tilde{b}) + m) - \tilde{s}_2$ be the payoff functions in fully revealing equilibrium. It was proved above that $\tilde{u}'(\theta) > 0$ and $\tilde{\pi}'(\theta) > 0$ and that $\tilde{u}(\theta_a) = \bar{u}_2^a = \gamma\bar{u}_2$ and $\tilde{\pi}(\theta_p) = \bar{u}_2^p = (1 - \gamma)\bar{u}_2$. Therefore:

$$\theta_a < \theta^* \iff \gamma\bar{u}_2 = \bar{u}_2^a = \tilde{u}(\theta_a) < \tilde{u}(\theta^*) \iff \gamma < \hat{\gamma}_1(\bar{u}_2) \equiv \frac{\tilde{u}(\theta^*)}{\bar{u}_2}.$$

$$\theta_p < \theta^* \iff (1 - \gamma)\bar{u}_2 = \bar{u}_2^p = \tilde{\pi}(\theta_p) < \tilde{\pi}(\theta^*) \iff \gamma > \tilde{\gamma}_2(\bar{u}_2) \equiv 1 - \frac{\pi(\theta^*)}{\bar{u}_2}.$$

Thus, if $\gamma > \gamma_1^*(\bar{u}_2) \equiv \max\{\hat{\gamma}_1(\bar{u}_2),\hat{\gamma}_2(\bar{u}_2)\}$, then $\theta_a > \theta^* > \theta_p$. And if $\gamma < \gamma_2^*(\bar{u}_2) \equiv \min\{\hat{\gamma}_1(\bar{u}_2),\hat{\gamma}_2(\bar{u}_2)\}$, then $\theta_a < \theta^* < \theta_p$. Finally, note that $\gamma_1^*(\bar{u}_2) \in (0,1)$, because $\tilde{u}(\theta)$, $\tilde{\pi}(\theta) > 0$ and $\tilde{u}(\theta) + \tilde{\pi}(\theta) = V(\theta e(\theta,\tilde{b}) + m) - C(e(\theta,\tilde{b})) < V(\theta e(\theta,V) + m) - C(e(\theta,V)) = S(\theta)$, where the inequality holds because $e(\theta,V)$ is the unique maximizer of $V(\theta e + m) - C(e)$. Therefore, $\tilde{u}(\theta^*)$, $\tilde{\pi}(\theta^*) < S(\theta^*) = \bar{u}_2$. ■

Proof of Theorem 1

Recall that the agent's and the principal's payoffs under full revelation, given participation at θ, are:

$$u(\theta) = b(\theta e(\theta) + m) - C(e(\theta)) + s_2$$
$$\pi(\theta) = (V - b)(\theta e(\theta) + m) - s_2.$$

Let $\Theta_i \subset R$ be a candidate pooling interval. Let $\bar{\theta}_i = E_\theta[\theta|\theta \in \Theta_i]$ be the average ability over Θ_i. As in the proof of Proposition 5, the agent's and principal's payoffs over the pool, given participation, are:

$$\hat{u}(\theta) = b(\theta e(\bar{\theta}_i) + m) - C(e(\bar{\theta}_i)) + s_2$$
$$\hat{\pi}(\theta) = (V - b)(\theta e(\bar{\theta}_i) + m) - s_2.$$

As shown previously, the project will be carried out if and only if $\sigma(\theta) > \max\{\theta_a,\theta_p\}$, where $\sigma(\theta) = \theta$ under full revelation and $\sigma(\theta) = \bar{\theta}_i$ under pooling.

Let the principal's actual payoffs (taking into account the participation decisions) be given by $\Pi^R(\theta)$ under revelation and $\Pi^P(\theta)$ under pooling. Note that pooling does not affect any decisions for $\theta \notin \Theta_i$, so that $\Pi^P(\theta) = \Pi^R(\theta)$ for all $\theta \notin \Theta_i$. For $\theta \in \Theta_i$, we have:

$$\Pi^R(\theta) = \begin{cases} \pi(\theta) & \text{if } \theta \geq \max\{\theta_a,\theta_p\} \\ \bar{u}_2^p & \text{otherwise.} \end{cases} \qquad \Pi^P(\theta) = \begin{cases} \hat{\pi}(\theta) & \text{if } \bar{\theta}_i \geq \max\{\theta_a,\theta_p\} \\ \bar{u}_2^p & \text{otherwise.} \end{cases}$$

Clearly, pooling is profitable if and only if $E_\theta\Pi^P(\theta) > E_\theta\Pi^R(\theta)$. Since $\Pi^P(\theta) = \Pi^R(\theta)$ for all $\theta \notin \Theta_i$, pooling is profitable if and only if $E_\theta[\Pi^P(\theta)|\Theta_i] > E_\theta[\Pi^R(\theta)|\Theta_i]$. In what follows, it will be important to note that, by Jensen's inequality, $E_\theta[\pi(\theta)|\Theta_i] > \pi(E_\theta[\theta|\Theta_i]) = \pi(\bar{\theta}) = \hat{\pi}(\bar{\theta}) = E_\theta[\hat{\pi}(\theta)|\Theta_i]$, where the last equality holds since $\hat{\pi}$ is linear in θ.

Part One

Let $\theta_a < \theta_p$, so $\theta_p = \max\{\theta_a, \theta_p\}$ and $\Pi^R(\theta) = \max\{\pi(\theta),\bar{u}_2^p\}$.
Consider cases:

1. If $\bar{\theta}_i < \theta_p$, then $E_\theta[\Pi^P(\theta)|\Theta_i] = E_\theta[\bar{u}_2^p|\Theta_i] \leq E_\theta[\max\{\bar{u}_2^p,\pi(\theta)\}|\Theta_i] = E_\theta[\Pi^R(\theta)|\Theta_i]$, and the inequality is strict if $\Pr\{\Theta_i \cap (\theta^p,\infty)\} > 0$. Thus, it never pays to pool.
2. If $\bar{\theta}_i > \theta^p$, then $E_\theta[\Pi^P(\theta)|\Theta_i] = E_\theta[\hat{\pi}(\theta)|\Theta_i] < E_\theta[\pi(\theta)|\Theta_i] \leq E_\theta[\Pi^R(\theta)|\Theta_i]$, where the strict inequality is just the conclusion from the Jensen's theorem argument above, and the weak inequality holds because $\Pi^R(\theta) = \max\{\bar{u}_2^p,\pi(\theta)\}$. Consequently, pooling is *strictly* worse than revelation.

Therefore, if $\theta_a < \theta_p$, the principal will not pool over any interval, and hence over any finite union of disjoint intervals: $\Theta = \emptyset$. This proves part one.

Part Two

Now let $\theta_p < \theta_a$, so $\theta_a = \max\{\theta_a, \theta_p\}$. We can immediately make two observations:

1. If $\Theta_i \subset (q_a,\infty)$, then $E_\theta[\Pi^P(\theta)|\Theta_i] = E_\theta[\hat{\pi}(\theta)|\Theta_i] < E_\theta[\pi(\theta)|\Theta_i] = E_\theta[\Pi^R(\theta)|\Theta_i]$, so that there will be no pooling.
2. If $\bar{\theta}_i < \theta_a$, then $\Pi^P(\theta) = \bar{u}_2^p$ and

$$\Pi^R(\theta) = \begin{cases} \bar{u}_2^p & \text{if } \theta < \theta_a \\ \pi(\theta) \geq \pi(\theta_a) > \pi(\theta_p) = \bar{u}_2^p & \text{otherwise.} \end{cases}$$

The inequalities above hold because π is increasing and $\theta_a < \theta_p$. Consequently, $\Pi^R(\theta) \geq \bar{u}_2^p$, and the inequality is strict if $\theta > \theta_a$. It follows that $E_\theta[\Pi^P(\theta)|\Theta_i] = E_\theta[\bar{u}_2^p|\Theta_i] \leq E_\theta[\Pi^R(\theta)|\Theta_i]$, and the inequality is strict if $\Pr\{\Theta_i \cap (\theta^a,\infty)\} > 0$. Thus, it never pays to pool.

Therefore, if $\Theta = \{\Theta_i\}_{i\in I}$ is a profitable pooling region, then it must be the case that, for all $i \in I$, $\Theta_i \cap (-\infty,\theta_a] \neq \emptyset$ and $\bar{\theta}_i \geq \theta_a$. This implies that $\theta_a \in \Theta_i$. Since all of the Θ_i are disjoint intervals, it follows that I is a singleton, i.e., $\Theta = \{[x,y)\}$, for some $y > x > 0$ such that $\bar{\theta} = E_\theta[\theta|\theta \in [x,y)] \geq \theta_a > \theta_p$ and $\theta_a \in [x,y)$. Since Θ is a singleton, I will now change notation slightly and denote $\Theta = [x,y)$.

Now, the principal's payoffs under pooling over $[x,y)$ are:

$$\Pi^P(\theta;x,y) = \begin{cases} \bar{u}_2^p & \text{if } \theta < x \\ \hat{\pi}(\theta) & \text{if } \theta \in [x,y) \\ \pi(\theta) & \text{if } \theta \geq y. \end{cases}$$

The principal's payoffs under revelation are $\Pi^R(\theta) = \Pi^P(\theta;q_a,q_a)$.

Thus, in choosing the optimal $[x,y)$, the principal solves:

$$\max_{x,y} \int_0^x \bar{u}_2^p f(\theta)d\theta + \int_x^y \hat{\pi}(\theta)f(\theta)d\theta + \int_y^\infty \pi(\theta)f(\theta)d\theta - \lambda(\theta_a - \bar{\theta}), \tag{A1}$$

which is the Lagrangian with the constraint $\bar{\theta} \geq \theta_a$. Now $\Pr(\Theta) = \Pr(x < \theta < y) = F(y) - F(x)$, and $\bar{\theta} \equiv E_\theta[\theta|\Theta] = \dfrac{1}{F(y) - F(x)} \displaystyle\int_x^y \theta f(\theta)d\theta$.

Taking derivatives and simplifying yields:

$$\frac{\partial\bar{\theta}}{\partial y} = \frac{f(y)}{\Pr(\Theta)}(y - \bar{\theta}) \quad \text{and} \quad \frac{\partial\bar{\theta}}{\partial x} = \frac{f(x)}{\Pr(\Theta)}(\bar{\theta} - x).$$

Differentiate (A1) with regard to y, x:

$$\hat{\pi}(y)f(y) - \pi(y)f(y) + \lambda\frac{\partial\bar{\theta}}{\partial y} = 0$$

$$\bar{u}_2^p f(x) - \hat{\pi}(x)f(x) + \lambda\frac{\partial\bar{\theta}}{\partial x} = 0.$$

So:

$$\Pr(\Theta)\,\frac{\pi(y) - \hat{\pi}(y)}{y - \bar{\theta}} = \lambda = \Pr(\Theta)\,\frac{\hat{\pi}(x) - \bar{u}_2^p}{\bar{\theta} - x} > 0.$$

Thus, the constraint binds, and $\bar{\theta} = \theta_a$. We can therefore define implicitly $y(x)$:

$$\theta_a = \frac{1}{F(y(x)) - F(x)} \int_x^{y(x)} \theta f(\theta) d\theta$$

$$y'(x) = \frac{f(x)(x - \theta_a)}{f(y)(y - \theta_a)} < 0.$$

Let $\alpha = \lim_{x \uparrow \theta_a} y'(x)$. Noticing that $\lim_{x \uparrow \theta_a} y(x) = \theta_a$, we have, by de l'Hopital:

$$\alpha = \lim_{x \uparrow \theta_a} \frac{f'(x)(x - \theta_a) + f(x)}{(f'(y(x))(y(x) - \theta_a) + f(y(x)))y'(x)} = \frac{f(\theta_a)}{f(\theta_a)\alpha} = \frac{1}{\alpha},$$

as long as $f'(\theta_a) < \infty$. Thus, $\alpha = 1/\alpha$, and therefore $\lim_{x \uparrow \theta_a} y'(x) = -1$.

Since $\Pi^R(\theta) = \Pi^P(\theta; x, y(x))$ outside the pooling region, we know that $E_\theta[\Pi^P(\theta; x, y(x))] > E_\theta[\Pi^R(\theta)]$ if and only if $E_\theta[\Pi^P(\theta; x, y(x)) | \Theta] > E_\theta[\Pi^R(\theta) | \Theta]$. Let $S(x) \equiv E_\theta[\Pi^P(\theta; x, y(x)) | \Theta] - E_\theta[\Pi^R(\theta) | \Theta]$ be the total surplus gained by pooling over $[x, y)$ (as opposed to revealing fully). Some pooling will occur if and only if $\exists x < \theta_a$ such that $S(x) > 0$.

The surplus $S(x)$ is made up by a gain from those with below-average ability and a loss from those with above-average ability, $S(x) = \mu(x) - \lambda(x)$ where:

$$\mu(x) = \frac{1}{F(y(x)) - F(x)} \int_x^{\theta_a} (\hat{\pi}(\theta) - \bar{u}_2^p) f(\theta) d\theta > 0,$$

$$\lambda(x) = \frac{1}{F(y(x)) - F(x)} \int_{\theta_a}^{y(x)} (\pi(\theta) - \hat{\pi}(\theta)) f(\theta) d\theta > 0.$$

The net surplus is given by:

$$\begin{aligned} S(x) &= \mu(x) - \lambda(x) \\ &= \frac{1}{F(y(x)) - F(x)} \left(\int_x^{y(x)} \hat{\pi}(\theta) f(\theta) d\theta - \bar{u}_2^p \int_x^{\theta_a} f(\theta) d\theta - \int_{\theta_a}^{y(x)} \pi(\theta) f(\theta) d\theta \right) \\ &= \frac{1}{F(y(x)) - F(x)} \left(\int_x^{y(x)} \hat{\pi}(\theta) f(\theta) d\theta - \bar{u}_2^p (F(\theta_a) - F(x)) - \int_{\theta_a}^{y(x)} \pi(\theta) f(\theta) d\theta \right). \end{aligned}$$

We want to show that it is profitable to pool, i.e., that $\exists x < \theta_a : S(x) > 0$. Notice that this is equivalent to proving:

$$\exists x < \theta_a : \frac{1}{F(y(x)) - F(x)} \int_x^{y(x)} \hat{\pi}(\theta) f(\theta) d\theta > \frac{\bar{u}_2^p (F(\theta_a) - F(x)) + \int_{\theta_a}^{y(x)} \pi(\theta) f(\theta) d\theta}{F(y(x)) - F(x)}.$$

By linearity of $\hat{\pi}$, this is equivalent to:

$$\exists x < \theta_a : \hat{\pi}(\theta_a) > \frac{\bar{u}_2^p(F(\theta_a) - F(x)) + \int_{\theta_a}^{y(x)} \pi(\theta)f(\theta)d\theta}{F(y(x)) - F(x)},$$

where the left-hand side is positive and independent of x. Now, define the function

$$\phi : (0,\theta_a) \rightarrow R$$

$$\phi(t) = \frac{\bar{u}_2^p(F(\theta_a) - F(t)) + \int_{\theta_a}^{y(t)} \pi(\theta)f(\theta)d\theta}{F(y(t)) - F(t)}.$$

We have that ϕ is continuous and, by de l'Hopital:

$$\begin{aligned}
\lim_{t\uparrow\theta_a} \phi(t) &= \lim_{t\uparrow\theta_a} \frac{\bar{u}_2^p(F(\theta_a) - F(t)) + \int_{\theta_a}^{y(t)} \pi(\theta)f(\theta)d\theta}{F(y(t)) - F(t)} \\
&= \lim_{t\uparrow\theta_a} \frac{-\bar{u}_2^p f(t) + y'(t)\pi(y(t))g(y(t))}{y'(t)f(y(t)) - f(t)} \\
&= \lim_{t\uparrow\theta_a} \frac{\pi(y(t))(\theta_a - t) + \bar{u}_2^p(y(t) - \theta_a)}{y(t) - t} \\
&\equiv A - B,
\end{aligned}$$

where the last equality follows by the definition of $y'(x)$. Now:

$$A = \lim_{t\uparrow\theta_a} \frac{\pi(y(t))(\theta_a - t) + \pi(y(t))(y(t) - \theta_a)}{y(t) - t} = \lim_{t\uparrow\theta_a} \pi(y(t)) = \pi(\theta_a) = \hat{\pi}(\theta_a)$$

$$\begin{aligned}
B &= \lim_{t\uparrow\theta_a}\left\{(\pi(y(x)) - \bar{u}_2^p) \cdot \frac{y(t) - \theta_a}{y(t) - t}\right\} \\
&= (\pi(\theta_a) - \bar{u}_2^p) \cdot \lim_{t\uparrow\theta_a} \frac{y(t) - \theta_a}{y(t) - t} \\
&= (\pi(\theta_a) - \bar{u}_2^p) \cdot \lim_{t\uparrow\theta_a} \frac{y'(t)}{y'(t) - 1} \\
&= \frac{1}{2}(\pi(\theta_a) - \bar{u}_2^p) > 0,
\end{aligned}$$

where that last equality follows by $\lim_{t\uparrow\theta_a} y'(t) = -1$. The inequality holds, because $\pi(\theta_a) > \pi(\theta_p) = \bar{u}_2^p$. Thus, $\lim_{t\uparrow\theta_a} \phi(t) = A - B < A = \hat{\pi}(\theta_a)$. By continuity, this means $\exists x < \theta_a :$ $\phi(x) < \hat{\pi}(\theta_a)$. Hence, pooling is profitable. ■

Proof of Proposition 9

The equilibrium is by construction. Let Z_j be the intervals over which π is concave, for $j \in J$. If π is convex everywhere, then $J = \emptyset$, and Theorem 1 will hold. Otherwise, since π is concave over Z_j, Jensen's inequality shows that:

$$E_\theta[\pi(\theta)|\theta \in Z_j] < \pi(E_\theta[\theta|\theta \in Z_j]) = \pi(\bar{\theta}_j) = \hat{\pi}(\bar{\theta}_j) = E_\theta[\hat{\pi}(\theta)|\theta \in Z_j]$$

where $\bar{\theta}_j = E_\theta[\theta|\theta \in T_j]$. Multiply both sides by $1/\Pr(Z_j)$ to see that the principal earns more profit by pooling than by revealing output.

The same analysis from the proof of Theorem 1 applies here, so $[x,y)$ will still be a pooling interval where $E_\theta[\theta|\theta \in [x,y)] = \theta_a$. Therefore, let $\Theta = \{Z_j\}_{j \in J} \cup \{[x,y)\}$. It is clear that the principal will pool over Θ and reveal ability outside of Θ. ■

Proof of Proposition 10

Note that by the single-crossing property the agent will adopt a cutoff continuation strategy under full revelation, i.e., $T_a = [\theta_a, \infty)$, where $\theta_a = \theta_0$. This is true because, given θ, it is profitable to continue if and only if $u(\theta) > \bar{u}_2^a(\theta)$. Furthermore, note that the proofs from Proposition 3 that $e'(\theta) > 0$, $u'(\theta) > 0$, $u''(\theta) > 0$, $\pi'(\theta) > 0$, and $\pi''(\theta) > 0$ are still valid in this new setting, since they do not depend on outside options. Furthermore, since π is still increasing and convex, Proposition 3's proof that the principal will also adopt a cutoff strategy remains valid as well. Thus, $T_p = [\theta_p, \infty)$.

The proofs of Propositions 4 and 5 also hold. In particular, effort over pooling regions is given by $\hat{e}(\theta) = e(\theta_i)$, which is constant over pooling intervals, strictly increasing elsewhere, and exhibits positive jumps at the endpoints of pooling intervals.

Proposition 6 holds in modified form. In particular, observe that:

1. If θ is revealed to the agent, then he should quit if and only if $\bar{u}_2^a(\theta) > u(\theta)$, which holds if and only if $\theta < \theta_a$, as shown before.
2. If Θ_i is revealed, the agent should quit if and only if $\bar{u}_2^i > E_\theta[\hat{u}(\theta)|\theta \in \Theta_i]$. Given that the market's beliefs are unbiased, $\bar{u}_2^i = E_\theta[\bar{u}_2^a(\theta)|\theta \in \Theta_i]$, so that the condition becomes: quit if and only if $E_\theta[\bar{u}_2^a(\theta) - \hat{u}(\theta)|\theta \in \Theta_i] > 0$.

The principal still adopts a straightforward cutoff strategy based on q_p, as in Proposition 6. Finally, Proposition 7 still clearly holds, but Proposition 8 has no obvious analog.

We are now ready to prove the main result. The proof will be based on the proof of Theorem 1. First, consider the case when $T_p \cap (T_a)^C = \emptyset$. This is equivalent to $\theta_a \leq \theta_p$. We see that the situation is equivalent to part one of Theorem 1, the proof of which still remains valid. Thus there is no pooling.

Next, consider the case when $T_p \cap (T_a)^C \neq \emptyset$, i.e., $\theta_a > \theta_p$. Let Θ_i be a candidate pooling interval. Now, the condition that $\Theta_i \cap (-\infty,\theta_a] \neq \emptyset$ from the proof of Theorem 1 still holds. Next, the condition that $\bar{\theta}_i \geq \theta_a$ from the proof of Theorem 1 now becomes $E_\theta[u(\theta) - \bar{u}_2^a(\theta)|\theta \in \Theta_i] \geq 0$. Together, these conditions imply that $\theta_a \in \Theta_i$ and therefore that there is at most one profitable pooling interval, $\Theta = [x,y)$.

The agent's problem becomes:

$$\max_{x,y}\int_0^x \bar{u}_2^p f(\theta)d\theta + \int_x^y \hat{\pi}(\theta)f(\theta)d\theta + \int_y^\infty \pi(\theta)f(\theta)d\theta - \lambda\int_x^y$$
$$[u(\theta) - \bar{u}_2^a(\theta)]f(\theta)d\theta, \tag{A2}$$

which is the Lagrangian with the constraint $E[u(\theta) - \bar{u}_2^a(\theta)|\theta \in [x,y)] \geq 0$. Just like in the proof of the original theorem, the first-order conditions show that $\lambda \neq 0$, and therefore:

$$\int_x^y [u(\theta) - \bar{u}_2^a(\theta)]f(\theta)d\theta = 0.$$

Consequently, we can define $y(x)$ implicitly by this relation. By the implicit function theorem:

$$y'(x) = \frac{f(x)(u(x) - \bar{u}_2^a(x))}{f(y)(u(y) - \bar{u}_2^a(y))} < 0.$$

Noting that, by single crossing, $u(\theta_a) = \bar{u}_2^a(\theta_a)$ and $u'(\theta_a) \neq (\bar{u}_2^a)'(\theta_a)$, we can essentially repeat the same argument as in the main theorem to show that $\lim\limits_{x \uparrow \theta_a} y'(x) = -1$.

All that remains to be shown to complete the proof is that pooling over some nontrivial interval of the form $[t,y(t))$ will indeed be profitable. Let $\Pi(t)$ be the expected net profit of the principal under pooling over $[t,y(t))$:

$$\Pi(t) = \int_0^t \bar{u}_2^p f(\theta)d\theta + \int_t^{y(t)} \hat{\pi}(\theta)f(\theta)d\theta + \int_{y(t)}^{\infty} \pi(\theta)f(\theta)d\theta.$$

Observe that, since Π is continuous, the principal will pool about θ_a if $\lim\limits_{x \uparrow \theta_a} \Pi'(x) < 0$.

Now, noting that $\lim_{x \uparrow \theta_a} y'(x) = -1$, $\lim_{x \uparrow \theta_a} \hat{\pi}(x) = \lim_{x \uparrow \theta_a} \pi(x) = \pi(\theta_a) > \bar{u}_2^p$, we get $\lim\limits_{x \uparrow \theta_a} \Pi'(x) = f(\theta_a)(\bar{u}_2^p - \pi(\theta_a)) < 0$. Thus, pooling is profitable. ■

Proof of Proposition 11

Let $\langle \theta_p, s_1, s_2, b, \Theta \rangle$ be a contract where $\Theta = [x,y)$ is the pooling region in Theorem 1. Recall that:

$$t'(\theta) = \begin{cases} 0 & \text{if } \theta \in \Theta_i \text{ for some } i \\ (V - b)\theta e'(\theta) & \text{otherwise.} \end{cases} \tag{A3}$$

If there is no pooling, then $t(\theta)$ is fully determined by (A3). Only the intercept must be determined but evidently it is profitable to set it to zero ($t(\theta_a) = 0$) and hence:

$$t^R(\theta) = \int_{q^a}^{\theta} (V - b)\omega e'(\omega)f(\omega)d\omega$$

is the transfer function under revelation. The derivative of t in the interval $[y,\infty)$ satisfies the same condition (A3), but the intercept is zero for all θ in $[x,y)$. So the transfer under pooling is:

$$t^P(\theta) = \begin{cases} 0 & \text{if } \theta \in [x,y) \equiv \Theta \\ \displaystyle\int_y^{\theta} (V - b)\omega e'(\omega)d\omega & \text{otherwise.} \end{cases}$$

Note that on the interval $[y,\infty)$ the function e is the same both for pooling and no pooling. (It solves the same F.O.C.) Evidently, for $\theta > y$ we will have that $t^P(\theta) = t^R(\theta) - t^R(y)$. So:

$$\int_x^\infty \{t^P(\theta) - t^R(\theta)\} f(\theta) d\theta < 0.$$

Hence, pooling over $[x,y)$ will be more profitable than no pooling at all.

From (A3), the transfer function is clearly increasing. Totally differentiating (A3):

$$\begin{aligned} t''(\theta) &= (V - b)(e'(\theta) + \theta e''(\theta)), \text{ so} \\ t''(\theta) &= (V - b)e'(\theta)\left(1 - C'''(e(\theta)) \frac{b\theta}{(C''(e(\theta)))^2}\right) \\ &= (V - b)e'(\theta)\left(1 - C'''(e(\theta)) \frac{C'(e(\theta))}{(C''(e(\theta)))^2}\right) > 0. \end{aligned}$$

Since $C'''/C'' < C''/C'$ and $e'(\theta) > 0$. So the transfer function is convex. ■

Proof of Proposition 12

Recall that, under full revelation, the continuation payoffs are:

$$\begin{aligned} u(\theta) &= E_\varepsilon R(\theta e(\theta) + \varepsilon) - C(e(\theta)) \\ \pi(\theta) &= V(\theta e(\theta) + m) - E_\varepsilon R(\theta e(\theta) + \varepsilon). \end{aligned}$$

Note that, since $e(\theta)$ is chosen optimally by the agent, the envelope theorem says that $u'(\theta) = E_\varepsilon[R'(\theta e(\theta) + \varepsilon)e(\theta)]$, so that a sufficient condition for condition 1 of the proposition is that $R' > 0$, for this condition would ensure $u'(\theta) > 0$.

Under pooling over some interval $[\alpha,\beta)$, effort has to be constant (say, $\hat{e}(\alpha,\beta)$) over the interval, so, on that interval, payoffs become:

$$\begin{aligned} \hat{u}(\theta;\alpha,\beta) &= E_\theta[E_\varepsilon R(\theta\hat{e}(\alpha,\beta) + \varepsilon) | \theta \in [\alpha,\beta)] - C(\hat{e}(\alpha,\beta)) \\ \hat{\pi}(\theta;\alpha,\beta) &= V(\theta\hat{e}(\alpha,\beta) + m) - E_\varepsilon R(\theta\hat{e}(\alpha,\beta) + \varepsilon). \end{aligned}$$

Note that both π and $\hat{\pi}$ are continuous and differentiable in θ.

The optimal effort under pooling is determined by the condition:

$$E_\theta[E_\varepsilon R'(\theta\hat{e}(\alpha,\beta) + \varepsilon)\theta | \theta \in [\alpha,\beta)] = C'(\hat{e}(\alpha,\beta)),$$

which shows that $\hat{e}(\alpha,\beta)$ is continuous in both arguments and therefore that $\hat{\pi}$ is also continuous in α and β. We also see that $\hat{e}(\theta,\theta) = e(\theta)$ and therefore that $\hat{\pi}(\theta,\theta,\theta) = \pi(\theta)$, for all θ.

Now, consider pooling over some interval $[t, y(t))$, where $t \in N_{\theta_a}$ and $y(\cdot)$ is the function from condition 3. Let $\Pi^R(\theta)$ be the principal's effective (participation-adjusted) payoff under full revelation, while $\Pi^P(\theta;t)$ is her effective payoff under pooling over $[t,y(t))$. Note that, for any t, $\Pi^R(\theta) = \Pi^P(\theta;t)$ for all $\theta \notin [t,y(t))$, and that for all $\theta \in [t,y(t))$, we have:

$$\Pi^R(\theta) = \begin{cases} \pi(\theta) & \text{if } \theta \geq \theta_a \\ \bar{u}_2^p & \text{otherwise.} \end{cases} \qquad \Pi^P(\theta;t) = \hat{\pi}(\theta;t,y(t))$$

Let $\Delta(t) \equiv E_\theta \Pi^P(\theta,t,y(t)) - E_\theta \Pi^R(\theta)$. Note that it is profitable to pool over $[t,y(t))$ if and only if $\Delta(t) > 0$. Now:

$$\Delta(t) = \int_t^{\theta_a} \{\hat{\pi}(\theta;t,y(t)) - \bar{u}_2^p\} f(\theta)d\theta - \int_{\theta_a}^{y(t)} \{\pi(\theta) - \hat{\pi}(\theta;t,y(t))\} f(\theta)d\theta.$$

Therefore, $\Delta(\theta_a) = 0$ and:

$$\begin{aligned} \Delta'(\theta_a) &= -(\hat{\pi}(\theta_a,\theta_a,\theta_a) - \bar{u}_2^p)f(\theta_a) - (\pi(\theta_a) - \hat{\pi}(\theta_a,\theta_a,\theta_a))f(\theta_a)y'(\theta_a) \\ &= (\bar{u}_2^p - \pi(\theta_a))f(\theta_a) < 0, \end{aligned}$$

where we have used the facts that $\hat{\pi}(\theta_a,\theta_a,\theta_a) = \pi(\theta_a)$, that $|y'(\theta_a)| < \infty$ and that $\pi(\theta_a) > \bar{u}_2^p$. Therefore, by continuity of Δ, there exists $t < \theta_a$ such that $\Delta(t) > 0$, i.e., there is a nontrivial profitable pooling region. ■

Proof of Proposition 13

Consider pooling over the interval $[t,y(t))$, where $y(\cdot)$ is as given in the statement of the proposition. Let $\hat{\pi}(q_1,t)$ be the principal's continuation payoffs over the pool. By continuity of $R(\cdot)$, $e_2\ (q_1)$ is also continuous, and so is $\hat{\pi}$. Therefore $\hat{\pi}(q_a,q_a) = \pi(q_a)$.

Let $\Pi(t)$ be the expected net profit of the principal under pooling over $[t,y(t))$, and let $e_1(t)$ be the agent's choice of first-period effort, under this pooling:

$$\begin{aligned} \Pi(t) = &\int_0^t \bar{u}_2^p g(q_1 - e_1(t))dq_1 + \int_t^{y(t)} \hat{\pi}(q_1,t)g(q_1 - e_1(t))dq_1 \\ &+ \int_{y(t)}^{\infty} \pi(q_1)g(q_1 - e_1(t))dq_1. \end{aligned}$$

Observe that a principal will pool about q_a if $\Pi'(q_a) < 0$. Now:

$$\begin{aligned} \Pi'(q_a) = &\ g(q_a - e_1(q_a))[\bar{u}_2^p - \hat{\pi}(q_a,q_a) + y'(q_a)(\hat{\pi}(q_a,q_a) - \pi(q_a))] \\ &-e_1'(q_a)\left[\int_0^{q_a} g'(q_1 - e_1(q_a))\bar{u}_2^p dq_1 + \int_{q_a}^{\infty} g'(q_1 - e_1(q_a))\pi(q_1)dq_1\right]. \end{aligned}$$

Substituting in $\hat{\pi}(q_a,q_a) = \pi(q_a)$ and integrating by parts:

$$\begin{aligned} \Pi'(q_q) &= g(q_a - e_1(q_a))(\bar{u}_2^p - \pi(q_a)) \\ &\quad -e_1'(q_a)[\bar{u}_2^p g(q_a - e_1(q_a)) - \pi(q_a)g(q_a - e_1(q_a)) \\ &\quad - \int_{q_a}^{\infty} \pi'(q_1)g(q_1 - e_1(q_q))dq_1] \\ &= g(q_a - e_1(q_a))(\bar{u}_2^p - \pi(q_a)) - e_1'(q_a)[(u_2^{-p} - \pi(q_a))g(q_a - e_1(q_a)) \\ &\quad - \int_{q_a}^{\infty} \pi'(q_1)g(q_1 - e_1(q_a))dq_1] < 0, \end{aligned}$$

where we have used the facts that $\pi'(q_1) > 0$, $\pi(q_a) > \pi(q_p) = \bar{u}_2^p$, and $e_1'(q_a) \leq 0$.

Since $\Pi'(q_a) < 0$, pooling will occur about q_a. ■

REFERENCES

Arvey, R. D., and A. P. Jones. 1985. The use of discipline in organizations: A framework for future research. In *Research in Organizational Behavior*, edited by L. Cummings, and B. Staw, 7. Greenwich, CT: JAI Press.

Bagnoli, M., and T. Bergstrom. 2005. Log-concave probability and its applications. *Economic Theory* 26 (2): 445–469.

Baiman, S. 1990. Agency research in managerial accounting: A second look. *Accounting, Organizations and Society* 15 (4): 341–371.

Bernardin, H. J., and R. W. Beatty. 1984. *Performance Appraisal: Assessing Human Behavior at Work.* Boston, MA: Kent Publishing Company.

Bjerke, D., J. Cleveland, R. Morrison, and W. Wilson. 1987. *Officer Fitness Report Evaluation Study.* Navy Personnel Research and Development Center Report TR 88-4. San Diego, CA: Navy Personnel Research and Development Center.

Cleveland, J. N., R. Morrison, and D. Bjerke. 1986. Rater intentions in appraisal ratings: Male-violent manipulation or functional fudging. Working paper, Society for Industrial and Organizational Psychology, Chicago, IL.

Darrough, M. N., and N. M. Stoughton. 1989. Financial disclosure policy in an entry game. *Journal of Accounting and Economics* 12: 219–243.

Dye, R. A. 1985. Disclosure of nonproprietary information. *Journal of Accounting Research* 23 (1): 123–145.

Gibbons, R., and K. J. Murphy. 1992. Optimal incentive contracts in the presence of career concerns: Theory and evidence. *Journal of Political Economy* 100 (3): 468–505.

Grossman, S. J. 1981. The informational role of warranties and private disclosure about product quality. *Journal of Law and Economics* 24 (3): 461–483.

———, and O. D. Hart. 1980. Disclosure laws and takeover bids. *Journal of Finance* 35 (2): 323–344.

Holmstrom, B. 1999. Managerial incentive problems: A dynamic perspective. *Review of Economic Studies* 66 (1): 169–182.

Jones, A. P., M. Tait, and M. C. Butler. 1983. Perceived punishment and reward values of supervisory actions. *Motivation and Emotion* 1 (September): 313–329.

Jung, W. O., and Y. K. Kwon. 1988. Disclosure when the market is unsure of information endowment of managers. *Journal of Accounting Research* 26 (1): 146–153.

Kay, E., H. Meyer, and J. French. 1965. Effects of threat in a performance interview. *Journal of Applied Psychology* 49 (December): 311–317.

Lambert, R. A. 2001. Contracting theory and accounting. *Journal of Accounting and Economics* 32 (1–3): 3–87.

Landy, F. J., and J. L. Farr. 1980. Performance rating. *Psychological Bulletin* 87 (January): 72–107.

Lizzeri, A., M. A. Meyer, and N. Persico. 2002. The incentive effects of interim performance evaluations. Working paper, University of Pennsylvania, Philadelphia, PA.

Longenecker, C. O., H. P. Sims, and D. A. Gioia. 1987. Behind the mask: The politics of employee appraisal. *Academy of Management Executive* 1: 183–193.

MacLeod, W. B. 2003. Optimal contracting with subjective evaluation. *American Economic Review* 93 (1): 216–240.

Meyer, M. A., and J. Vickers. 1997. Performance comparisons and dynamic incentives. *Journal of Political Economy* 105 (3): 547–581.

Milgrom, P. R. 1981. Good news and bad news: Representation theorems and applications. *The Bell Journal of Economics* 12 (2): 380–391.

Milkovich, G. T., and A. K. Wigdor, eds. 1991. *Pay for Performance: Evaluating Performance Appraisal and Merit Pay*. Washington, D.C.: National Academy Press.

———, and J. M. Newman, eds. 1996. *Compensation*. Chicago, IL: McGraw-Hill/Irwin.

Mitchell, T. R., and C. A. O'Reilly. 1983. Managing poor performance and productivity in organizations. In *Research in Personnel and Human Resources Management*, edited by K. Rowland, and G. Ferris, 1. Greenwich, CT: JAI Press.

Mohrman, A. M., and E. E. Lawler. 1983. Motivation and performance appraisal behavior. In *Performance Measurement and Theory*, edited by F. Landy et al., 173–189. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Murphy, K. R., and J. N. Cleveland. 1991. *Performance Appraisal: An Organizational Perspective*. Needham Heights, MA: Allyn & Bacon.

Newman, P., and R. Sansing. 1993. Disclosure policies with multiple users. *Journal of Accounting Research* 31 (1): 92–112.

Okuno-Fujiwara, M., A. Postlewaite, and K. Suzumura. 1990. Strategic information revelation. *The Review of Economic Studies* 57 (1): 25–47.

Prendergast, C., and R. H. Topel. 1996. Favoritism in organizations. *Journal of Political Economy* 104 (5).

Rajan, M. V., and S. J. Reichelstein. 2006. Subjective performance indicators and discretionary bonus pools. *Journal of Accounting Research* 44 (3): 585–617.

Saal, F. E., R. G. Downey, and M. A. Lahey. 1980. Rating the ratings: Assessing the quality of rating data. *Psychological Bulletin* 88: 413–428.

———, and P. A. Knight. 1988. *Industrial/Organizational Psychology: Science and Practice*. Pacific Grove, CA: Brooks/Cole.

Schall, M. S. 1983. A communication-rules approach to organizational culture. *Administrative Science Quarterly* 28 (December): 557–581.

Shin, H. S. 1994. News management and the value of firms. *The RAND Journal of Economics* 25 (1): 58–71.

Verrecchia, R. E. 1983. Discretionary disclosure. *Journal of Accounting and Economics* 5: 179–194.

———. 2001. Essays on disclosure. *Journal of Accounting and Economics* 32: 97–180.

THE ACCOUNTING REVIEW
Vol. 82, No. 2
2007
pp. 427–455

The Effects of Sarbanes-Oxley on Auditing and Internal Control Strength

Evelyn R. Patterson
Indiana University

J. Reed Smith
Indiana University

ABSTRACT: We provide a theoretical investigation of the effects of the Sarbanes-Oxley Act of 2002 on auditing intensity and internal control strength. We propose a model of strategic auditing in which the auditor can use resources for both internal control tests and substantive tests, while the manager can choose the strength of internal controls and the amount of fraud.

We find that control tests are a valuable tool for the auditor when control strength is informative about the likelihood of fraud. We find that Sarbanes-Oxley has the desired effect of inducing stronger internal control systems and less fraud, but does not necessarily induce higher levels of control testing. Our model suggests that audit risk increases as a result of the Sarbanes-Oxley Act.

Keywords: *Sarbanes-Oxley Act; internal control; fraud; strategic auditing.*

I. INTRODUCTION

Business fraud is a major concern in the accounting profession and in the business community at large. The current audit environment emphasizes the independent auditor's responsibility for detecting and deterring fraud. Managers of public companies are subject to new fraud prevention measures enacted under the Sarbanes-Oxley Act of 2002 and administered by the Securities and Exchange Commission (SEC). Managers must certify their financial statements and audit committees that oversee the audit function are subject to stricter guidelines. In addition, Sarbanes-Oxley places a stronger emphasis on a company's internal controls and requires auditors to evaluate and report on internal controls. The purpose of this paper is to examine how Sarbanes-Oxley may affect the strategic aspects of a firm's internal control choice and the auditor's strategic testing of internal control.

Management designs and implements the system of internal controls. Strong internal controls make fraud difficult to commit and make fraud discovery likely. But they cannot

---

Helpful comments were given by Paul Fischer, John Hassell, Laureen Maines, Paul Newman, Jerry Salamon, Mike Stein, Phillip Stocken, Martin Wu, an anonymous reviewer, Madhav Rajan (editor), and workshop participants at the University of Oregon and Indiana University. We thank Jyoti Sarkar for his invaluable help with our analysis.

Editor's note: This paper was accepted by Madhav Rajan.

Submitted July 2005
Accepted August 2006

completely prevent fraud because managers can override the system of controls.[1] Managers who are intent on committing fraud have an incentive to design weaknesses into the system of controls because the benefits to fraud are more enticing to dishonest managers when the system of controls is weak.

Statement on Auditing Standards (SAS) No. 99, *The Consideration of Fraud in a Financial Statement Audit* (AICPA 2002), specifically requires that auditors consider the possibility of management override of internal controls. The possibility of override potentially alters the auditor's testing methodology. The auditor's evaluation and testing of internal controls provide information about the manager's incentives and opportunity to commit fraud because a weaker system of control makes fraud less difficult to perpetrate.

We examine a model in which a possibly dishonest manager chooses a level of internal control. The manager then perpetrates some amount (possibly zero) of fraud. The auditor investigates the client's choices in two ways. First, the auditor tests the system of internal control. Then, based upon the results of this test, he chooses an amount of substantive testing. Control tests that indicate weaker controls yield more substantive testing and control tests that indicate stronger controls yield less substantive testing. However, control tests only provide the auditor with information about the manager's choice of internal control strength and the probability of fraud. They do not provide direct evidence of fraud. Only substantive testing can reveal actual fraud.

We compare two variations of the model. In our benchmark model, the manager is not penalized directly for having a weak system of control.[2] The only benefit for a dishonest manager to choose a strong system of control is that it allows him to mimic the choice of an honest manager. Under our Sarbanes-Oxley variation, we penalize the manager if the auditor determines that the controls are weak. This penalty reflects the manager's responsibility under Section 302 of Sarbanes-Oxley. In addition, under the Sarbanes-Oxley variation, we require some minimum level of internal control tests, which is necessary if the auditor is to report on the system of control as required under Section 404.

Sarbanes-Oxley provides a direct mechanism for enforcement of the auditor's internal control testing methodology, but there is no such mechanism that guarantees the accuracy of the auditor's evaluation. Due to random sampling of controls the auditor may conclude, based on the evidence collected, that controls are strong when in fact they are weak. This type of evaluation error would likely be discovered only in the event of an alleged audit failure in which the auditor concludes that the financial statements are materially correct when they are not. Thus, we also consider the possible effects of an increase in the auditor's expected liability related to audit failure.

Under Sarbanes-Oxley, we find that the dishonest manager chooses a stronger system of controls and less fraud. As a result, control tests become less diagnostic about the probability of fraud. Unconstrained, the auditor would perform less control testing under Sarbanes-Oxley. However, the amount of control testing increases if the amount before Sarbanes-Oxley is less than the minimum required to report under Section 404.

If the equilibrium amount of control testing increases in order to meet the minimum required under Sarbanes-Oxley, the average amount of substantive testing decreases. In this case, the auditor's overall expected costs could either increase or decrease, depending on whether the increase in the cost of control testing or the decrease in the expected cost of substantive testing dominates. Finally, audit risk, which is the probability of undetected fraud, goes up with Sarbanes-Oxley, while expected fraud goes down. Firm losses from expected undetected fraud do not change.[3]

---

[1] This is consistent with the findings of Ashbaugh et al. (2005) and Doyle et al. (2005). Both studies find disclosed internal control weaknesses to be inversely related to accruals quality.

[2] A "weak system of internal control" in our model is a relative term and does not mean that the entity is unauditable.

The PCAOB released a report on November 30, 2005 on the implementation of Sarbanes-Oxley entitled *Report on the Initial Implementation of Auditing Standard No. 2, An Audit of Internal Control Over Financial Reporting Performed in Conjunction with an Audit of Financial Statements* (PCAOB 2005b). The report discusses how the PCAOB intended for Sarbanes-Oxley to add efficiencies to the audit because Sarbanes-Oxley requires companies to have stronger systems of internal controls and suggests ways for firms to take advantage of those efficiencies. Recent empirical studies, including Hogan and Wilkins (2006) and Beneish et al. (2006), document an increase in audit fees due to the internal control reporting requirements of Sarbanes-Oxley, based in part on the increase in billable hours. The increase in fees may be due to start-up costs, which we do not model, inefficiencies that the PCAOB did not anticipate, or reflect additional litigation risk faced by auditors. Our results suggest that economic efficiencies can arise if the required internal control testing under Sarbanes-Oxley is not too large. If the required internal control testing is substantially higher than prior to Sarbanes-Oxley, our model predicts that audit costs and, therefore audit fees, can increase.

Matsumura and Tucker (1992) (hereafter, MT), Caplan (1999) and Smith et al. (2000) (hereafter, STV) all examine internal control issues in strategic settings. As these studies were all prior to Sarbanes-Oxley, they could not possibly evaluate the impact of Sarbanes-Oxley on internal control. In addition, they do not consider all of the strategies that we consider in this model and, thus, the results of our model are not directly comparable to these earlier models of internal control.

MT and STV both consider the auditor's use of internal control evaluation in substantive testing, but neither of these studies considers the manager's strategic choice of controls. Caplan (1999), on the other hand, considers the manager's control system choice, but the auditor does not strategically evaluate or test controls. Because Sarbanes-Oxley addresses the issue of management responsibility for internal controls and the auditor's evaluation of these controls, we include *both* the manager's control system decision and the auditor's testing of controls in our fraud detection game.

Our model is most similar to STV because we study the importance of control tests despite the manager's ability to override controls and the inability of control tests to detect fraud directly. Control tests in STV only provide information about the manager's override cost and not the manager's strategy. STV shows that control tests may be economically worthwhile for an auditor even if they cannot directly detect fraud. Audit efficiency is improved because control tests provide information about the manager's incentives to commit fraud and the likelihood of fraud. In our study, control tests provide information about the manager's *choice* of control system strength and the manager's type—honest or dishonest. We allow the dishonest manager to trade off between a stronger system with increased personal costs to override the system and a weaker system that potentially identifies him as being dishonest. Internal control testing indirectly deters fraud by motivating the dishonest manager to choose a stronger system of internal controls.

The nature of this trade-off changes under Sarbanes-Oxley. Because Sarbanes-Oxley imposes a direct penalty for weak internal control systems, dishonest managers choose stronger systems and lower amounts of fraud. This, in turn, affects the auditor's incentives to test controls and identify fraud.

---

[3] Expected fraud is computed as the probability that the manager is dishonest times the amount of fraud that a dishonest manager chooses in equilibrium. Expected undetected fraud is computed as the probability that fraud is undetected times expected fraud.

The remainder of the paper is organized as follows. Section II describes our model of internal control and Section III provides an analysis of the benchmark model. Section IV describes how Sarbanes-Oxley affects the strategic interaction between the auditor and manager and Section V concludes the paper.

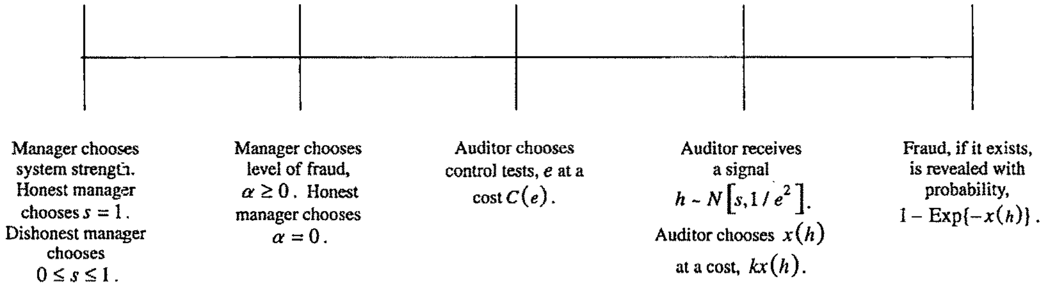
II. MODEL OF INTERNAL CONTROL

In this section, we describe our benchmark model of internal control. The benchmark model corresponds to audits of companies prior to Sarbanes-Oxley and those not governed by Sarbanes-Oxley.[4] The purpose of control testing is to assess internal control strength.[5] Strong internal controls prevent or detect material misstatements, which in turn allow the auditor to perform less substantive testing in achieving a given level of audit risk. While the manager can override even strong controls in order to perpetrate fraud, overriding strong controls is more difficult and costly. As internal control strength increases, the net benefit of perpetrating fraud diminishes.

Sequence of Events

The sequence of events is shown in Figure 1. To represent the auditor's uncertainty regarding the manager's motivation in choosing fraud and control strength, we assume two manager types, $t \in \{D,H\}$. Type D denotes a dishonest-type manager and type H denotes an honest-type manager.[6] The prior probability that the manager is the dishonest-type is θ

FIGURE 1
Timeline of Action Choices



Manager chooses system strength. Honest manager chooses $s = 1$. Dishonest manager chooses $0 \leq s \leq 1$.

Manager chooses level of fraud, $\alpha \geq 0$. Honest manager chooses $\alpha = 0$.

Auditor chooses control tests, e at a cost $C(e)$.

Auditor receives a signal $h \sim N\left[s, 1/e^2\right]$. Auditor chooses $x(h)$ at a cost, $kx(h)$.

Fraud, if it exists, is revealed with probability, $1 - \text{Exp}\{-x(h)\}$.

---

[4] For example, the benchmark model might reflect the *status quo* in Canada or the U.K. or private companies in the U.S.

[5] Prior to Sarbanes-Oxley, the auditor's internal control testing choice was guided by *Consideration of Internal Control in a Financial Statement Audit,* Statement on Auditing Standards (SAS) No. 78 (AICPA 1995). SAS No. 78, paragraph .03 says that an assessment of control risk below the maximum requires the auditor to obtain evidential matter that supports such an assessment via tests of control. If performing only substantive tests is more efficient, the auditor may forgo tests of control and leave control risk set at the maximum. However, even if the auditor does not perform control tests, he must acquire an *understanding* of the control system prior to designing substantive tests.

[6] We examine a model with two types of managers—an honest and dishonest type, but refer to the manager's type as dishonest or honest merely as an expositional convenience. Equivalently, we could refer to these two types as fraudulent and not fraudulent or some other designation. The honest manager chooses the strongest possible system of internal controls, while the dishonest manager chooses a level of internal controls that is of lesser or equal strength. The important point is that the two types represent the auditor's uncertainty about the manager's incentives to commit fraud.

and the prior probability that the manager is the honest-type is $1 - \theta$. The manager first chooses the strength of internal controls, $s \in [0,1]$, followed by an amount of fraud, $\alpha \geq 0$. The honest-type always chooses the strongest internal control system, which we denote as $s = 1$, and never commits fraud, $\alpha = 0$. The dishonest-type has an incentive to commit fraud so that $\alpha \geq 0$, and potentially chooses a relatively weaker internal control system, $0 \leq s \leq 1$.[7] The manager's choices occur before the auditor performs any control testing or substantive testing.

The auditor also has two choices. He first chooses the amount of control tests and then, based upon the outcome of those tests, an amount of substantive tests. Control tests, in our model, provide information about the strength of controls but do not provide direct evidence of fraud. Only substantive tests can detect fraud.[8]

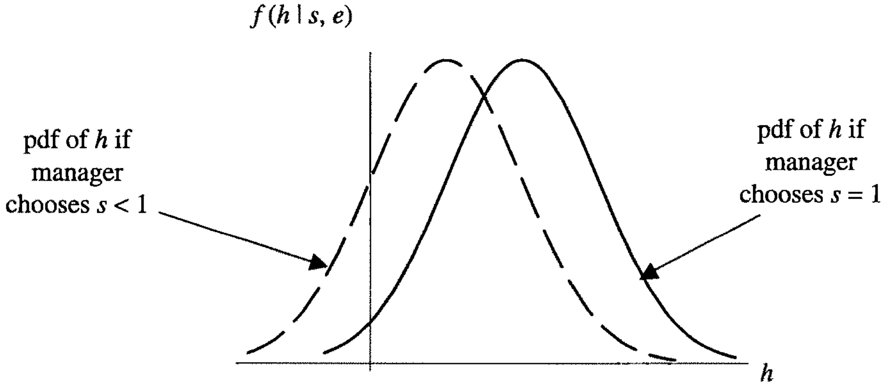
We designate the choice of control testing effort as e that produces an outcome statistic, h. The random variable, $\tilde{h}$, is distributed normally with mean s, variance, $1/e^2$, density, $f(h|s,e)$, and cumulative distribution, $F(h|s,e)$. The manager chooses the mean of the distribution and the auditor chooses the precision. The auditor observes a value of h and then updates the probability that the manager is dishonest ($t = D$) using Bayes' Rule.

$$\Pr(D|h,s,e) = \frac{f(h|s,e)\theta}{f(h|s,e)\theta + f(h|1,e)(1 - \theta)}. \tag{1}$$

The auditor knows that h comes from one of two normal distributions: one with a mean of s and the other with a mean of 1 as shown in Figure 2. The outcome statistic h provides the auditor with imperfect information about s, which, in turn, provides information about the manager's type and the probability of fraud.

Once the auditor observes h, he chooses the level of substantive tests, $x(h)$, where $1 - \text{Exp}\{-x(h)\}$ is the probability that the auditor detects a fraudulent misstatement given

FIGURE 2
Distribution of h for $s < 1$ and $s = 1$



---

[7] Strong internal control systems have many benefits that are not modeled here. We assume the only incentive for a dishonest manager to choose a strong system is to avoid the scrutiny of the auditor.

[8] Typically tests of control do not by themselves yield evidence of fraud. They measure how often a control is not working as described and therefore provide indicators about the likelihood of material misstatement. This assumption is consistent with Matsumura and Tucker (1992) and STV.

that one exists. This detection function increases in audit effort at a decreasing rate and has been widely used in the strategic audit literature (see STV and Patterson and Noel [2003] [hereafter, PN], for examples).

Payoff Structure

The auditor incurs costs for performing audit work and also faces potential litigation and reputation costs in the event fraud occurs and is not detected. The auditor chooses the amount of control tests and the amount of substantive tests to minimize his total costs, which include the costs of performing audit work and the expected cost of an audit failure.[9] The costs of performing audit work are the combined costs of internal control testing and substantive testing. If the manager perpetrates a fraud that goes undetected by the auditor, the auditor suffers a penalty proportionate to the magnitude of the fraud. The auditor's penalty for undetected fraud is $L\alpha$, where $L > 0$ is a multiplier that scales the auditor's expected penalty to the amount of fraud, α.[10]

Based upon the auditor's updated probability assessment of fraud, $\Pr(D|h,s,e)$, the auditor chooses an amount of substantive testing, $x(h)$, where $\mathrm{Exp}\{-x(h)\}$ is the probability that fraud is not detected. As a result, the joint probability that a fraud occurs and goes undetected is $\Pr(D|h,s,e)\mathrm{Exp}\{-x(h)\}$, and the auditor's expected cost for undetected fraud is $\Pr(D|h,s,e)\mathrm{Exp}\{-x(h)\}L\alpha$.

The auditor adds this cost to the cost of substantive testing, $kx(h)$, to yield his conditional expected payoff for an observed value of h in the second stage of the game:

$$A_h = -\Pr(D|h,s,e)\mathrm{Exp}\{-x(h)\}L\alpha - kx(h). \tag{2}$$

The auditor's overall payoff includes an expectation of A_h and a cost of evaluating controls, $C(e)$. We assume that $C'(e) > 0$ and $C''(e) > 0$ (the cost of control testing effort is an increasing, convex cost).[11] The auditor's expected payoff, at the time he chooses the level of internal control testing, is equal to:

$$\begin{aligned} A = \int_{-\infty}^{\infty} &(-\Pr(D|h,s,e)\mathrm{Exp}\{-x(h)\}L\alpha - kx(h))(\theta f(h|s,e) \\ &+ (1 - \theta)f(h|1,e))dh - C(e). \end{aligned} \tag{3}$$

The expectation is computed using the unconditional density of $\tilde{h}$, $\theta f(h|s,e) + (1 - \theta)f(h|1,e)$ because manager-type is unknown to the auditor.

The dishonest manager's payoff includes the benefit from undetected fraud, αR, the penalty, αP, that he incurs if the fraud is detected, and the cost of overriding internal controls, $s^2\omega\alpha$.[12] Both the benefits and penalties associated with fraud are increasing in the amount of fraud. The personal cost to the manager of overriding controls is increasing in both the amount of fraud and system strength because larger frauds and stronger controls involve more elaborate schemes to override controls.[13] If there were no fraud, then $\alpha = 0$ and therefore the cost of override would equal zero. The manager incurs the cost of overriding controls regardless of whether the auditor detects the fraud.

---

[9] In this model, we consider an audit failure to be equivalent to the existence of undetected fraud.

[10] While the auditor's penalty may equal the amount of fraud ($L = 1$), this is not necessarily the case. Using this scaling variable allows us to examine how the strategies are affected by the degree to which the auditor is held culpable for undetected fraud. In addition, this scaling parameter admits the possibility that the fraud may *never* be detected. Reputation damage and punitive liability would be reflected in increases in the value of L and the possibility that a given fraud would not, in fact, result in any cost to the auditor would tend to be reflected by decreases in L. A fraud might not result in a cost to the auditor either because the fraud is not discovered or because the auditor successfully defends himself against prosecution.

[11] We also assume that $(C'(e)/e)|_{e=0}$ to ensure that an interior solution exists for e. An example of such a cost function is ce^3 where c is a constant.

[12] The manager's cost of overriding internal controls must be a strictly convex function of control strength s. For simplicity we use a quadratic form, setting the cost equal to $s^2\omega\alpha$.

The dishonest manager does not observe h and, consequently, averages his expected payoff over h, using the density of h, given his choice of control system strength, s. His expected payoff is:

$$M = \alpha\int_{-\infty}^{\infty} \{\mathrm{Exp}\{-x(h)\}R - (1 - \mathrm{Exp}\{-x(h)\})P - s^2\omega\}f(h|s,e)dh. \tag{4}$$

Unlike the auditor, the manager does not observe any information in between his sequential choices of s and α. Hence, only one payoff function is relevant for the manager and the manager optimizes simultaneously over both choices.

Finally, we require that $P > \omega$, so that fraud detection yields a more severe penalty than the personal cost associated with overriding controls. If not, the auditor's substantive tests provide limited deterrence relative to overriding controls. For example, suppose P is zero. Then the manager would choose $s = 0$ and no interior maximum of α would exist. In order to ensure concavity of the manager's expected payoff and obtain interior solutions, we assume that $P > \omega$.

III. ANALYSIS OF THE BENCHMARK MODEL

Because the auditor has two sequential choices, we follow the traditional solution technique of solving backward for his choices. For the manager, we consider the first-order condition for each of his two choices.

Auditor's Choice of Substantive Testing

The auditor's choice of substantive testing is subsequent to all other choices in the model. At the time that the auditor chooses the amount of substantive testing, he knows the outcome of control testing, h. The auditor's first-order condition with respect to x is:

$$\frac{dA_h}{dx(h)} = \alpha\Pr(D|h,s,e)L\mathrm{Exp}\{-x(h)\} - k = 0. \tag{5}$$

Consequently:

$$x(h) = \mathrm{Log}\left(\frac{\alpha\Pr(D|h,s,e)L}{k}\right). \tag{6}$$

The expression for substantive effort is similar to previous studies, such as STV and PN. The amount of substantive testing increases in the amount of fraud, α, and the cost parameter for undetected fraud, L, while it decreases in the cost of substantive effort, k. Because the auditor observes a signal about the dishonest-type, substantive effort in our setting also depends on the updated probability that the manager is the dishonest-type, $\Pr(D|h,s,e)$. As the observed h increases, this updated probability decreases and, as a result, substantive testing effort, x, decreases.

---

[13] In 1989 Comptronix Corporation executives devised an elaborate scheme to record fraudulent sales so that receivables would not be extraordinarily high. They first overrode controls to record the bogus sales. Then they recorded bogus equipment purchases and cut checks to pay down the bogus account payables, but never mailed the checks. Instead they used the checks to pay down account receivables. This is an example in which the amount of fraud affects management's cost of overriding controls.

Auditor's Choice of Control Testing Effort

The auditor's overall expected payoff is given by Expression (3). Because the auditor knows his own testing strategy for any h, we substitute for $x(h)$ prior to determining the first-order condition for his choice of control testing effort, e. Thus the auditor's first-order condition with respect to internal control testing effort e is:[14]

$$-k\frac{dE(x(h))}{de} = C'(e). \tag{7}$$

The left-hand side of Expression (7) is the change in the average substantive effort cost as control testing effort, e, changes. The right-hand side is the marginal cost of control testing effort. Because the cost function $C(e)$ is convex, Expression (7) implies that the change in the average substantive effort relative to a change in control testing effort equals the ratio of marginal costs for control and substantive tests and is negative or that:

$$\frac{dE(x(h))}{de} = \frac{C'(e)}{-k} < 0. \tag{8}$$

Manager's Choices

Because the manager chooses the amount of fraud and system strength without knowing the auditor's testing choices, the dishonest manager's first-order condition for fraud, α, is:

$$\frac{dM}{d\alpha} = \int_{-\infty}^{\infty} (\mathrm{Exp}\{-x(h)\}(R + P))f(h|s,e)dh - P - s^2\omega = 0. \tag{9}$$

After substituting for $x(h)$ from Expression (6) and solving for α we obtain the manager's choice of fraud:

$$\alpha = \frac{k(R + P)}{\theta L(P + s^2\omega)}. \tag{10}$$

The amount of fraud is directly related to the cost of substantive testing, k, and the reward to fraud, R, while it decreases in the prior probability that the manager is the dishonest type, θ, the system strength, s, and override cost ω, *ceteris paribus*.

Next, we consider the manager's choice of control system strength, s. We assume that the honest manager chooses the maximum (feasible) level of control system strength or $s = s_{Max} = 1$. For the honest manager, the benefits (net of the cost) for $s = 1$ are positive. The dishonest manager, however, has an incentive to commit fraud, which requires overriding internal controls at a cost of $\alpha s^2\omega$.

The dishonest manager's first-order condition for the choice of control system strength, s, is:

---

[14] See the proof to Proposition 1 in the Appendix for a derivation of this expression.

$$\frac{dM}{ds} = \alpha\left\{\int_{-\infty}^{\infty}\{\mathrm{Exp}\{-x(h)\}(R + P)\}e^2 f(h|s,e)(h - s)dh - 2s\omega\right\} = 0. \tag{11}$$

After substituting for $x(h)$ from Expression (6) and α from Expression (10), the manager's equilibrium condition for s is:

$$e^2(1 - s)(1 - \theta) - \frac{2s\omega}{(P + s^2\omega)} = 0. \tag{12}$$

Finally, because we have an explicit expression for fraud, we substitute Expression (10) into $x(h)$ in Expression (6) to obtain an expression for $x(h)$ that is free of α:[15]

$$x(h) = \mathrm{Log}\left(\Pr(D|h,s,e)\,\frac{(R + P)}{\theta(P + s^2\omega)}\right). \tag{13}$$

Equilibrium Results

In solving for the equilibrium of the benchmark model, we use the Bayes-Nash Equilibrium solution concept. The Bayes-Nash Equilibrium requires that each player's choices, at each decision point, be optimizing, given their subjective beliefs about the type and strategy of the opposing player at that decision point.

Proposition 1: There exists an equilibrium to our internal control game represented by a vector of choices $\{s,\alpha,e,x(h)\}$ that simultaneously satisfy Expressions (7), (10), (12), and (13).

All proofs are in Appendix.

The auditor's substantive testing effort depends on the outcome, h, of control testing effort, e. As h increases, the auditor infers that the probability of fraud is less likely. The manager anticipates the auditor's substantive testing strategy and he determines his choice of fraud, α, based upon his own reward and penalties and the auditor's costs.

The manager's choice of system strength s affects his choice of fraud. Control strength and the amount of fraud are inversely related as shown in Expression (10). Increases in system strength provide a deterrence to fraud because as system strength increases, the cost of overriding controls increases in proportion to the amount of fraud.

We next provide, as a corollary to Proposition 1, a result that demonstrates the strategic character of the dishonest manager's system choice.

Corollary 1: In the benchmark case, when the cost of overriding internal controls is positive ($\omega > 0$), the dishonest manager never chooses the maximum internal control strength, i.e., $s < s_{Max} = 1$.

---

[15] Technically, $x(h) = \mathrm{Log}\left(\Pr(D|h,s,e)\,\frac{(R + P)}{\theta(P + s^2\omega)}\right)$ when $h < \varsigma$, and $x(h) = 0$ when $h \geq \varsigma$ where ς solves $\Pr(D|h = \varsigma,s,e) = \frac{\theta(P + s^2\omega)}{(R + P)}$. However, for simplicity, we ignore the possibility of extreme high values of h where $x(h)$ may be zero. Note that if R is large, then $x(h) = 0$ is a small probability event regardless of the size of other parameters as long as $R > P > \omega$. We assume that R is large.

If the dishonest manager were to choose the maximum internal control strength ($s = s_{Max} = 1$), then control testing would provide no information concerning manager type. Consequently, the auditor's control testing effort, e, would be zero and the manager, in turn, would choose the minimum control system strength of $s = 0$. Thus, $s = 1$ cannot be an equilibrium choice for the dishonest manager.

A dishonest manager has no incentive to choose the strongest available system, not because he inherently has no need to install a system he intends to override, but because the auditor can learn nothing from testing controls. The manager prefers that the auditor perform control testing because on average an increase in control testing decreases the amount of substantive testing. The manager also has an incentive to install an internal control system that is greater than the minimum because control testing provides information about the manager's type and the penalty for fraud detection P is greater than the marginal cost of overriding controls . The dishonest manager wishes to mimic the honest type to the extent that it is cost effective in committing fraud.

In the next section, we modify our model to consider the impact of the Sarbanes-Oxley Act on the auditor's and manager's equilibrium strategies.

IV. THE EFFECT OF SARBANES-OXLEY ON INTERNAL CONTROL

Prior to Sarbanes-Oxley, the professional literature viewed control testing solely as supporting the auditor's attestation of the financial statements and stated that control tests were not required. However, Sarbanes-Oxley has expanded the auditor's role in the area of internal control evaluation for public companies. In addition to financial statement fairness, the auditor must now report on the adequacy of internal controls.

Under Section 302 of Sarbanes-Oxley, the manager is subject to substantial penalties if the auditor discovers significant internal control deficiencies. We assume that the auditor finds internal controls to be inadequate if the outcome h of control testing is less than some exogenous lower threshold of internal control sufficiency q where $q \in [0,1]$.[16] The auditor reports this inadequacy to the manager's detriment because the manager is responsible for the establishment and certification of internal controls. We assume that the manager suffers a penalty V when $h < q$. We subtract the expected penalty $F(q|s,e)V$ from the manager's payoff in Expression (4) to obtain:

$$M = \alpha\int_{-\infty}^{\infty}\{\mathrm{Exp}\{-x(h)\}R - (1 - \mathrm{Exp}\{-x(h)\})P - s^2\omega\}f(h|s,e)dh - F(q|s,e)V. \tag{14}$$

The manager's first-order condition for his choice of system strength, s, is now equal to:

$$\frac{k(R + P)}{L\theta}\left(e^2(1 - s)(1 - \theta) - \frac{2s\omega}{(P + s^2\omega)}\right) + f(q|s,e)V = 0. \tag{15}$$

In addition, we assume that in order to report on controls under Section 404 of Sarbanes-Oxley, the auditor must perform at least some base-level of internal control testing, $e \geq e_{SOX} > 0$.

---

[16] We interpret q as the required amount of system strength under Sarbanes-Oxley and the strongest system available is $s = 1$. If the manager chooses $s = 1$, then the expected signal is $h = 1$. If $q > 1$, then $h < q$ more than half of the time, even when choosing the strongest possible system. Thus, Sarbanes-Oxley would have little motivational effect on the manager's choice of system strength. For this reason, we restrict $q \in [0,1]$.

The equilibrium, under Sarbanes-Oxley, is similar to the one in the benchmark setting defined by Proposition 1 because the auditor's payoff has not fundamentally changed.[17] The differences include the manager's choice of s that satisfies Expression (15) and control testing effort that equals e_{SOX} if the equilibrium control testing effort defined by Expression (7) is less than e_{SOX}. Proposition 2 describes how implementing Sarbanes-Oxley affects the auditor's and manager's equilibrium choices relative to the benchmark setting. For the propositions that follow, assume that e_B and e are the equilibrium control test effort choices under the benchmark and Sarbanes-Oxley settings, respectively.

Proposition 2: Implementing Sarbanes-Oxley results in an increase in system strength, s, and a decrease in fraud, α. If $e_B > e_{SOX}$, then the amount of internal control testing decreases under Sarbanes-Oxley to $e \geq e_{SOX}$. If $e_B < e_{SOX}$, then the amount of internal control testing increases to $e = e_{SOX}$.

When we add the Sarbanes-Oxley penalty to the manager's expected payoff, the choice of system strength, s, increases because the manager is less likely to be assessed the penalty V for stronger systems of internal control. This results in a decrease in the amount of fraud, α. However, the penalty V could never be assessed unless the auditor performs control tests. As system strength increases, the auditor would reduce control testing effort unless the reduction would drive control testing effort below the minimum required for the auditor to report under Section 404, e_{SOX}.

The effect of Sarbanes-Oxley on the average amount of substantive testing, $E[x(h)]$, and the auditor's expected costs, $k + kE[x(h)] + C(e)$, is not as straightforward.

Proposition 3: Denote e_B as the equilibrium level of control testing in the benchmark setting. Implementing Sarbanes-Oxley results in:

(1) a decrease in the average amount of substantive testing if $e_{SOX} > e_B$; otherwise the effect is ambiguous; and
(2) a decrease in the auditor's expected costs if $e_B > e_{SOX}$; otherwise the effect is ambiguous.

Proposition 3 shows that Sarbanes-Oxley may result in some efficiencies. The amount of average substantive testing decreases when control test effort increases and the auditor's expected cost decreases when control testing effort decreases. However, the direction of change is ambiguous for expected substantive testing effort and expected audit costs for some values of e_{SOX}. We show these possibilities in the numerical examples summarized in Table 1.

There are five numerical examples shown in Table 1, labeled A–E. Example A shows the numerical values of effort e_B, expected substantive effort $E[x(h)]$ and expected audit costs $k + kE[x(h)] + C(e)$ for the benchmark case. Examples B and C show that expected

---

[17] The PCAOB enforces the provisions of Sarbanes-Oxley by conducting investigations of firms covered by Sarbanes-Oxley (see PCAOB [2005a, 13] for a description of the PCAOB's oversight procedures). If audit firms do not comply, then they are penalized. The addition of e_{SOX} as the minimum control test effort has an implied payoff effect. That is, we assume that the auditor incurs a severe penalty if he does not meet the minimum requirements of Sarbanes-Oxley. However, there are no provisions under Sarbanes-Oxley to investigate whether the auditor's evaluation of a firm's internal control was correct. The PCAOB does not perform independent control testing. Such an evaluation would occur only when there is an alleged audit failure. Thus, the other possible payoff effect would be an increase in L. See Proposition 4.

TABLE 1
Comparisons of Audit Costs and Substantive Testing Effort for Different Values of e_{SOX}

	Benchmark	$e_{SOX} < e_B$		$e_B < e_{SOX}$	
	A	B	C	D	E
	$V = 0$	$V = 2$	$V = 2$	$V = 2$	$V = 2$
		$e_{SOX} = 1.25$	$e_{SOX} = 1.5$	$e_{SOX} = 1.7$	$e_{SOX} = 3$
Internal control testing effort (e)	1.538 (e_B)	1.250	1.500	1.700	3.000
Substantive testing effort ($E[x(h)]$)	1.599	1.604[a]	1.559[a]	1.531	1.453
Expected audit costs	13.177	13.116	12.961	12.901[b]	13.617[b]

Assumptions: $\theta = .55$, $L = 100$, $R = 40$, $P = 8$, $\omega = 4$, $k = 5$, $q = .3$

[a] The direction of change in substantive testing relative to the benchmark case is ambiguous when $e_{SOX} < e_B$ (Proposition 3, part (1)).

[b] The direction of change in expected audit costs relative to the benchmark case is ambiguous when $e_B < e_{SOX}$ (Proposition 3, part (2)).

substantive effort can increase or decrease relative to the benchmark when $e_{SOX} < e_B$ (part (1) of Proposition 3 when $e_{SOX} < e_B$). Examples D and E show that expected audit costs can increase or decrease relative to the benchmark case when $e_B < e_{SOX}$ (part (2) of Proposition 3 when $e_B < e_{SOX}$).[18]

There are two key parameters that correspond to a shift to Sarbanes-Oxley; the auditor's minimum internal control testing effort e_{SOX} and the manager's penalty V for not maintaining sufficiently strong controls. By contrast, there is no provision for penalizing the auditor if he makes an incorrect evaluation of internal controls. The PCAOB oversight is limited to ensuring that sufficient testing was performed or that e_{SOX} was met. The only auditor penalty for an incorrect evaluation of internal control or the financial statements is a civil penalty that arises from audit failure. There has been much speculation about whether auditor civil penalties would change under Sarbanes-Oxley. In our model this would be represented by a change in the liability parameter L. But unlike V increasing from a zero to a non-zero amount, there is no identifiable change in L that corresponds to a shift to Sarbanes-Oxley. Thus, our analysis of the relation between changes in L and the equilibrium choices of the auditor and manager is restricted to a particular setting, either within the Sarbanes-Oxley or within the benchmark model. Proposition 4 provides results about the change in L in each of these settings.

Proposition 4: Under Sarbanes-Oxley, an increase in the auditor's liability parameter, L, causes an increase in system strength, s, a decrease in control testing effort, e (when $e > e_{SOX}$), and a decrease in fraud α. In the benchmark case, only the amount of fraud decreases in L.

Proposition 4 shows that in a Sarbanes-Oxley environment changes in L have broader effects on equilibrium behavior. An increase in the liability parameter L, affects system strength, control test effort, and fraud in the Sarbanes-Oxley setting. By contrast, L affects only the amount of fraud in the benchmark setting. Unless the manager is subject to a penalty for inadequate controls V, an increase in L has no effect on system strength s or control test effort e. Expressions (15), (7), and (13) together determine the equilibrium choices of s and e but only Expression (15) includes the auditor's liability parameter L. Expression (15) shows that the manager balances the marginal expected penalty arising from a weak system of controls under Sarbanes-Oxley against the marginal effect of system strength on the expected payoff from fraud net of detection and override costs. In the benchmark model (when V is zero) the auditor's liability parameter L can be factored out of the manager's first-order condition and therefore L has no impact on the manager's choice of system strength or the auditor's internal control test effort.

---

[18] The relative magnitudes of e_B and e_{SOX} is an empirical question. Anecdotal evidence suggests that e_{SOX} is substantially larger, but this could be due the newness of the Sarbanes-Oxley requirements that are not well-defined or start-up costs that make e_{SOX} appear to be large.

There has been recent concern over the unknown ramifications of Sarbanes-Oxley. These concerns range from the high initial start-up costs to the stringent requirements of Sarbanes-Oxley. On May 16, 2005, the PCAOB released a *Report on the Initial Implementation of Auditing Standard No. 2, An Audit of Internal Control over Financial Reporting Performed in Conjunction with an Audit of Financial Statements* (PCAOB 2005a). This report is the result of a roundtable discussion about the implementation of Sarbanes-Oxley and states:

> Many issues were raised ... at the Securities and Exchange Commission's Roundtable on Implementation of Internal Control Reporting Provisions, on April 13, 2005. While Roundtable participants generally supported the objectives of Section 404, many expressed concerns about compliance costs and offered constructive comments about how the implementation process can be improved ... Companies have found the requirements costly and demanding, and many have questioned whether the benefits are worth the costs.

Many companies have complained about the extraordinary requirements of Sarbanes-Oxley involving the documentation and testing of internal controls. Prior to Sarbanes-Oxley, documentation was typically not extensive and neither the company nor the auditor was required to test controls. With the adoption of Sarbanes-Oxley many companies must put in place new controls, provide a narrative about all controls, indicate in written form anytime a control is performed and then test whether controls are working. System strength encompasses all of these elements.

The one parameter in our model that relates to the stringent internal control requirements of Sarbanes-Oxley described above is q. A higher q would indicate that the auditor is looking for controls over more processes and/or controls that are more extensively documented. For example, if vendor invoice entries are recalculated as a check for accuracy, then the documentation of performance could be either a check mark, initials, or a signature. Each of these progressively provides more information about the person checking the figures and thus, better establishes performance and responsibility for the control.

Those who set the standards for implementing Sarbanes-Oxley might assume that a higher q would result in a higher system strength s. However, Proposition 5 shows that this is not always the case.

Proposition 5: Under Sarbanes-Oxley:

(1) If q is less than the manager's equilibrium choice of system strength, s, then an increase in q results in an increase in s.
(2) If q is greater than the manager's equilibrium choice of system strength, s, then an increase in q results in a decrease in s.

For values of q less than the equilibrium value of s, an increase in q does increase s. But the opposite is true for values of q greater than the equilibrium value of s. As q increases, compliance is more difficult and the manager is more likely to incur the penalty V for any given choice of system strength. If q is set too high, then the manager's ability to effect changes in the marginal expected cost of the auditor finding a system to be weak diminishes.

Unlike the benchmark model in Section III, the dishonest manager may now choose internal control strength $s = s_{MAX} = 1$. This occurs if the marginal cost of overriding internal controls for a given level of fraud, $2s\omega$, is less than the marginal expected cost under Sarbanes-Oxley of not maintaining a sufficiently strong internal control system, $f(q|s,e)V$. Such an equilibrium can be sustained only because there exists an imposed minimum amount of control testing effort, e_{SOX}. Corollary 2 describes the case in which the dishonest manager chooses $s = 1$.

Corollary 2: If the Sarbanes-Oxley internal control penalty to the manager V is sufficiently large (or the cost multiplier for overriding controls ω is sufficiently small), then implementing Sarbanes-Oxley results in the following equilibrium strategies:

$$x = \text{Log}\left(\frac{R + P}{P + \omega}\right), \tag{16}$$

$$\alpha = \frac{k(R + P)}{\theta L(P + \omega)}, \tag{17}$$

$$s = 1, \text{ and} \tag{18}$$

$$e = e_{SOX}. \tag{19}$$

The effect of Sarbanes-Oxley on system strength, s, in this case, is clearly positive as s increases to the maximum of 1. As a result, the auditor would like to choose control testing effort e equal to 0, but must choose $e = e_{SOX}$ in order to issue a report on internal controls under Section 404 of Sarbanes-Oxley. The amount of fraud α under Sarbanes-Oxley is strictly less than the amount in the benchmark setting (Proposition 1), because s has increased to 1. The amount of substantive testing effort, x, involves two effects, one from the increase in system strength s and one from the change in control test effort e. As system strength increases, the average amount of substantive testing decreases. Thus, the amount of substantive testing given in Expression (16) is less than the average amount of substantive testing under the benchmark model if control test effort increases under Sarbanes-Oxley. Otherwise the results are inconclusive.

Audit Performance Measures

Because Sarbanes-Oxley was enacted to reduce fraud and audit failures related to fraud, we are especially interested in how the Sarbanes-Oxley affects three audit performance measures: expected fraud, audit risk, and expected undetected fraud. Expected fraud is the amount of fraud multiplied by the probability that the manager is dishonest and is computed as:

$$EF = \theta\alpha = \frac{k(R + P)}{L(P + s^2\omega)}. \tag{20}$$

The equilibrium value of EF differs between the two models because the equilibrium choice of s differs. Because Sarbanes-Oxley causes s to increase (and potentially L), the dishonest manager's choice of fraud necessarily decreases. Hence, expected fraud decreases as a result of Sarbanes-Oxley.

Audit risk is the probability that a material misstatement occurs and is not detected by the audit process. Within the context of our model, audit risk is the updated probability of a dishonest manager multiplied by the probability that fraud is not detected by substantive tests and averaged over all possible outcomes of h. Audit risk (AR) is computed as:

$$\begin{aligned} AR &= \int_{-\infty}^{\infty} \Pr(D|s,e)\mathrm{Exp}\{-x(h)\}(\theta f(h|s,e) + (1 - \theta)f(h|1,e))dh \\ &= \frac{k}{L\alpha}\int_{-\infty}^{\infty} \Pr(D|s,e)\frac{1}{\Pr(D|s,e)}(\theta f(h|s,e) + (1 - \theta)f(h|1,e))dh. \end{aligned} \tag{21}$$

Given the equilibrium choices defined in both models, audit risk can be characterized as:

$$AR = \frac{k}{L\alpha} = \frac{\theta(P + s^2\omega)}{R + P}. \tag{22}$$

For the same reason that expected fraud decreases, audit risk increases. The first equality in Expression (22) shows that audit risk and the amount of fraud α are inversely related. Likewise, audit risk and the auditor's liability parameter L are inversely related. However, because the amount of fraud α *decreases* in L (see Expression (10)), audit risk is not affected by a change in L as shown in the second equality in Expression (22). Consequently, audit risk increases as we move from the benchmark model to Sarbanes-Oxley (see Proposition 2) or if L increases within the Sarbanes-Oxley setting (see Proposition 4) because in each case the equilibrium value of system strength s increases.[19]

Finally, expected undetected fraud is the amount of fraud perpetrated in equilibrium multiplied by audit risk (AR):

$$EUF = AR^*\alpha = \frac{k}{L}. \tag{23}$$

From Expression (23) we observe that only k and L affect the amount of expected undetected fraud, in equilibrium. As a result, Sarbanes-Oxley affects the amount of expected undetected fraud only if there is a corresponding increase in the auditor's liability parameter L. If L increases under Sarbanes-Oxley, the probability of undetected fraud goes up (audit risk) while the amount of fraud goes down (expected fraud) at a greater rate.

---

[19] Note that audit risk in our model does not relate to the amount of fraud, only to the likelihood that it is detected. If a manager is dishonest, he will commit fraud with certainty. However, because the magnitude of the fraud is decreasing in system strength, the auditor's incentives to detect fraud are diminished when system strength increases.

V. CONCLUSION

The current audit environment emphasizes the independent auditor's responsibility for detecting and deterring fraud and managers of public companies are subject to new fraud prevention measures. As a result of Sarbanes-Oxley, the Securities and Exchange Commission requires management to certify the financial statements and auditors to evaluate and report on internal controls. We examine a strategic model of auditing in which the manager chooses internal control strength and the amount of fraud while the auditor chooses the amounts of internal control testing and substantive testing. In our model the dishonest manager can override controls, which is more costly with stronger controls, and the honest manager chooses the highest level of internal control strength. As a result, the auditor's assessment of control strength provides information about the probability of fraud. We consider how Sarbanes-Oxley affects the interactions of the auditor and manager.

Prior to Sarbanes-Oxley, testing of internal controls was optional. If internal controls were relatively weak and offered no cost-savings in audit testing, then the auditor could choose to perform only substantive testing. Under Sarbanes-Oxley, a base-level of control testing is required and the manager is penalized if the firm's controls do not meet a minimum level of control strength.

We find that as a result of Sarbanes-Oxley, internal control strength increases and the amount of fraud decreases. The amount of internal control testing can either increase or decrease. The natural inclination is for internal control testing to decrease because as control strength increases, control testing provides less information about the probability of fraud. On the other hand, the amount of control testing can increase if the amount before Sarbanes-Oxley is less than the minimum required to report under Section 404.

There is some empirical evidence that indicates the amount of control testing has increased relative to levels prior to Sarbanes-Oxley, but the increase may be due to start-up procedures in some cases. Beneish et al. (2006) and Hogan and Wilkins (2006) both document a substantial cross-sectional increase in audit fees with the initial enactment of Sarbanes-Oxley. *The Controller's Report* (2005a) also reports that in 2004 audit fees rose for all of the Big 4 accounting firms where the increases range from 78 percent to 134 percent. However, as suggested by the PCAOB, some of this jump may be due to start-up costs. A survey conducted by CRA, International (2005) indicates that "average total 404 implementation costs are expected to decline in the second year." The same finding is reported by *The Controller's Report* (2005a) where 85 percent of surveyed companies expect compliance costs to decrease in 2005 due to "streamlined processes, a need for less new documentation, the elimination of start-up costs, and improved focus on key controls." Furthermore, *The Controller's Report* (2005b) states, "Fully 67.6% of companies expect their audit fees to decrease in 2006."

Our finding that an increase in system strength accompanies a decrease in fraud due to Sarbanes-Oxley is consistent with some early empirical results. The survey conducted by CRA, International (2005) indicates that a major cost of implementation in the first year was remediation of system weaknesses. As the weaknesses have been addressed, these costs are expected to provide increased efficiency in the second year. According to Roberts (2006), 16 percent of 3,900 reporting companies stated that internal controls were not effective with 1,500 companies reporting material weaknesses in internal control in the first year. In the second year, only 7 percent of the 3,000 companies found ineffective internal controls, and 400 companies reported material weaknesses. With regard to fraud, Cohen et al. (2005) find a dramatic decline in discretionary accruals subsequent to Sarbanes-Oxley. This early result indicates that the incidence of fraud may be decreasing as a result of

Sarbanes-Oxley because large discretionary accruals are frequently associated with earnings management.

Our model also suggests that the requirements for system strength (q in our model) can influence the effectiveness of Sarbanes-Oxley. If the required system strength is set too high, then the amount of increase in system strength that could be gained from Sarbanes-Oxley is reduced. The manager, in this case, realizes that increasing system strength is relatively ineffective at avoiding the noncompliance penalty.

Sarbanes-Oxley has the potential to improve the audit function by improving internal control, thereby decreasing the incidence of fraud. While audit costs have increased in the short-run, the steady-state equilibrium may result in lower audit costs and greater audit efficiency. However, extreme regulatory parameters can cause dysfunctional auditor and manager behavior. Holding firms to unattainable standards for internal controls induces firms to choose weaker systems. Similarly, an excessive requirement for internal control testing by auditors can increase audit costs along with the fees that cover those costs.

APPENDIX

Proof of Proposition 1

(1) Substantive Effort Choice, x(h)

$$\frac{dA_h}{dx} = \alpha \Pr(D|h,s,e) L \operatorname{Exp}(-x(h)) - k = 0. \tag{A1}$$

Consequently:

$$x(h) = \operatorname{Log}\left(\frac{\alpha \Pr(D|h,s,e)L}{k}\right). \tag{A2}$$

After substituting for α (see part (3) below) we get:

$$x(h) = \operatorname{Log}\left(\Pr(D|h,s,e)\,\frac{(R+P)}{\theta(P+s^2\omega)}\right). \tag{A3}$$

(2) Internal Control Test Effort, e

After substituting $x(h)$ from Expression (A2) into Expression (3), Expression (3) can be written as:

$$\begin{aligned} A &= \int_{-\infty}^{\infty} \{-k - kx(h)\}(\theta f(h|s,e) + (1-\theta)f(h|1,e))dh - C(e) \\ &= -k - kE[x(h)] - C(e). \end{aligned}$$

Thus, the auditor's first-order condition for internal control test effort e is:

$$-k\,\frac{dE[x(h)]}{de} = C'(e). \tag{A4}$$

This expression is the condition that is stated in Proposition 1.

Below we obtain a more detailed expression for the auditor's first-order condition that we use in proving later Propositions.

$$\frac{dE[x(h)]}{de} = \int_{-\infty}^{\infty} \frac{dx(h)}{de} (\theta f(h|s,e) + (1 - \theta)f(h|1,e))dh + \int_{-\infty}^{\infty} x(h) \frac{d(\theta f(h|s,e) + (1 - \theta)f(h|1,e))}{de} dh$$

where:

$$\frac{dx(h)}{de} = \frac{d\mathrm{Log}(\Pr(D|h,s,e))}{de} + \frac{d\mathrm{Log}\left(\frac{\alpha L}{k}\right)}{de} = \frac{d\mathrm{Log}(\Pr(D|h,s,e))}{de}.$$

First note that:

$$\Pr(D|h,s,e) = \frac{\theta f(h|s,e)}{\theta f(h|s,e) + (1 - \theta)f(h|1,e)} = \frac{1}{1 + (1 - \theta)f(h|1,e)/\theta f(h|s,e)} \tag{A5}$$

$$= \frac{1}{1 + \frac{(1 - \theta)}{\theta} \mathrm{Exp}\left[-\frac{e^2}{2} ((h - 1)^2 - (h - s)^2) \right]} \tag{A6}$$

$$= \frac{1}{1 + \frac{(1 - \theta)}{\theta} \mathrm{Exp}\left[-\frac{e^2}{2} ((1 + s - 2h)(1 - s)) \right]}. \tag{A7}$$

Thus:

$$\frac{d\mathrm{Log}(\Pr(D|h,s,e))}{de} = \frac{1}{\Pr(D|h,s,e)} \frac{d\Pr(D|h,s,e)}{de}$$
$$= -\frac{1}{\Pr(D|h,s,e)} (\Pr(D|h,s,e))^2 \frac{(1 - \theta)}{\theta} * \mathrm{Exp}\left[-\frac{e^2}{2} (1 + s - 2h)(1 - s) \right](-e(1 + s - 2h)(1 - s))$$
$$= \Pr(D|h,s,e) \frac{(1 - \theta)f(h|1,e)}{\theta f(h|s,e)} e(1 + s - 2h)(1 - s)$$
$$= \frac{ef(h|1,e)(1 + s - 2h)(1 - s)(1 - \theta)}{\theta f(h|s,e) + (1 - \theta)f(h|1,e)}.$$

Thus:

$$\begin{aligned}
&\int_{-\infty}^{\infty} \frac{dx(h)}{de}(\theta f(h|s,e) + (1-\theta)f(h|1,e))dh \\
&= e\int_{-\infty}^{\infty} f(h|1,e)(1+s-2h)(1-s)(1-\theta)dh \\
&= (1-s)(1-\theta)e\left\{\int_{-\infty}^{\infty} f(h|1,e)(-2h)dh + \int_{-\infty}^{\infty} f(h|1,e)(1+s)dh\right\} \\
&= (1-s)(1-\theta)e\{-2+(1+s)\} \\
&= -(1-s)^2(1-\theta)e. \qquad \text{(A8)}
\end{aligned}$$

Also:

$$\begin{aligned}
&\int_{-\infty}^{\infty} x(h)\frac{d(\theta f(h|s,e) + (1-\theta)f(h|1,e))}{de}dh \\
&= -e\int_{-\infty}^{\infty} \mathrm{Log}(\Pr(D|h,s,e))\left(\begin{array}{l}\theta f(h|s,e)((h-s)^2 - 1/e^2) \\ + (1-\theta)f(h|1,e)((h-1)^2 - 1/e^2)\end{array}\right)dh. \qquad \text{(A9)}
\end{aligned}$$

Next we apply integration by parts to simplify the above integral.

Let $U = \mathrm{Log}(\Pr(D|h,s,e))$ and $DV = \left(\begin{array}{l}\theta f(h|s,e)((h-s)^2 - 1/e^2) \\ + (1-\theta)f(h|1,e)((h-1)^2 - 1/e^2)\end{array}\right)dh$, then Expression (A9) is equal to $-\left(UV|_{-\infty}^{\infty} - \int_{-\infty}^{\infty} V\,DU\right)$.

Using this approach, Expression (A9) simplifies to (details from authors are available upon request):

$$e(1-s)^2(1-\theta)\int_{-\infty}^{\infty} f(h|1,e)\Pr(D|h,s,e)dh. \qquad \text{(A10)}$$

Thus, the first-order condition for internal control test effort is:

$$A_e = e(1-s)^2(1-\theta)\left\{1 - \int_{-\infty}^{\infty} f(h|1,e)\Pr(D|h,s,e)dh\right\} - \frac{C'(e)}{k} = 0 \qquad \text{(A11)}$$

where the sum of (A8) and (A10) is substituted for $\frac{dE[x(h)]}{de}$ in (A4).

(3) Fraud Choice, α

M from Expression (4) can be rewritten as:

$$M = \alpha\left\{\int_{-\infty}^{\infty}\{\mathrm{Exp}(-x(h))(R+P)\}f(h|s,e)dh - P - s^2\omega\right\}. \qquad \text{(A12)}$$

In order to facilitate later derivations and without loss of generality, we substitute for $x(h)$ using $x_0(h) = \mathrm{Log}\left(\Pr(D|h,s_0,e)\,\frac{\alpha_0 L}{k}\right)$ where s_0 and α_0 are fixed and represent the auditor's conjectures of s and α:

$$
\begin{aligned}
M &= \alpha\left\{\int_{-\infty}^{\infty}\left\{\frac{k}{\alpha_0 L}(R+P)\,\frac{\theta f(h|s_0,e) + (1-\theta)f(h|1,e)}{\theta f(h|s_0,e)}\right\}f(h|s,e)dh - P - s^2\omega\right\}\\
&= \alpha\left\{\frac{k}{\alpha_0 L\theta}(R+P)\int_{-\infty}^{\infty}\left\{\theta f(h|s,e) + \frac{(1-\theta)f(h|s,e)f(h|1,e)}{f(h|s_0,e)}\right\}dh - P - s^2\omega\right\}\\
&= \frac{\alpha k}{\alpha_0 L\theta}(R+P)\left\{\theta + (1-\theta)\int_{-\infty}^{\infty}\frac{f(h|s,e)f(h|1,e)}{f(h|s_0,e)}\,dh\right\} - \alpha(P + s^2\omega)
\end{aligned}
$$

where:

$$
\begin{aligned}
&\int_{-\infty}^{\infty}\frac{f(h|s,e)f(h|1,e)}{f(h|s_0,e)}\,dh = \int_{-\infty}^{\infty}\frac{e\mathrm{Exp}\left(-\frac{e^2}{2}(h-s)^2\right)\mathrm{Exp}\left(-\frac{e^2}{2}(h-1)^2\right)}{\sqrt{2\pi}\mathrm{Exp}\left(-\frac{e^2}{2}(h-s_0)^2\right)}\,dh\\
&= \int_{-\infty}^{\infty}\frac{e}{\sqrt{2\pi}}\mathrm{Exp}\left(-\frac{e^2}{2}\{(h-1)^2 + (h-s)^2 - (h-s_0)^2\}\right)dh\\
&= \mathrm{Exp}(-e^2(s-s_0)(s_0-1))\int_{-\infty}^{\infty}\frac{e}{\sqrt{2\pi}}\mathrm{Exp}\left(-\frac{e^2}{2}\{(h-(1+s-s_0))^2\}\right)dh\\
&= \mathrm{Exp}(-e^2(s-s_0)(s_0-1)).
\end{aligned}
$$

Thus:

$$
M = \frac{\alpha k}{\alpha_0 L\theta}(R+P)\{\theta + (1-\theta)\mathrm{Exp}(-e^2(s-s_0)(s_0-1))\} - \alpha(P + s^2\omega).
$$

Consequently:

$$
\frac{dM}{d\alpha} = \frac{k}{\alpha_0 L\theta}(R+P)\{\theta + (1-\theta)\mathrm{Exp}(-e^2(s-s_0)(s_0-1))\} - (P + s^2\omega). \tag{A13}
$$

After substituting for the equilibrium values of $s_0 = s$ and $\alpha_0 = \alpha$ because the auditor's conjectures must be correct in equilibrium, we have:

$$
\begin{aligned}
&= \frac{k}{\alpha L\theta}(R+P) - (P + s^2\omega) = 0\\
&\Rightarrow \alpha = \frac{k(R+P)}{\theta L(P + s^2\omega)}.
\end{aligned}
\tag{A14}
$$

(4) System Choice, s

$$\frac{dM}{ds} = \frac{\alpha k}{\alpha_0 L\theta}(R + P)\{e^2(1 - s_0)(1 - \theta)\mathrm{Exp}(-e^2(s - s_0)(s_0 - 1))\} - \alpha(2s\omega). \tag{A15}$$

After substituting for the equilibrium values of $s_0 = s$ and $\alpha_0 = \alpha$ because the auditor's conjectures must be correct in equilibrium and using (A14), we obtain the manager's equilibrium condition for s:

$$e^2(1 - \theta)(1 - s) - \frac{2s\omega}{(P + s^2\omega)} = 0 \tag{A16}$$

Proof to Corollary 1

Suppose $s = 1$ in equilibrium, then $\Pr(D|h,s,e) = \theta$ because both the honest and dishonest types choose $s = 1$. Thus x no longer depends on h. In addition the auditor's first-order condition for e:

$$A_e = e(1 - s)^2(1 - \theta)\left\{1 - \int_{-\infty}^{\infty} f(h|1,e)\Pr(D|h,s,e)dh\right\} - \frac{C'(e)}{k}$$

becomes $-\frac{C'(e)}{k} < 0$ for all e, which implies that $e = 0$.

However, the manager's equilibrium condition is:

$$e^2(1 - \theta)(1 - s) - \frac{2s\omega}{(P + s^2\omega)} = -\frac{2s\omega}{(P + s^2\omega)} < 0$$

for either $e = 0$ or $s = 1$, implying that s cannot be equal to 1 and contradicts our original assumption.

Proof to Proposition 2

We use the implicit function theorem and want to show how control test effort e and system strength s change with respect to V at $V = 0$; that is, as V is increasing from zero. Recall that the auditor's first-order condition for his choice of internal control test e is:

$$A_e = e(1 - s)^2(1 - \theta)\left\{1 - \int_{-\infty}^{\infty} f(h|1,e)\Pr(D|h,s,e)dh\right\} - \frac{C'(e)}{k} = 0,$$

(see Expression (A11)) and the manager's equilibrium condition for his choice of s is:

$$M_s = \frac{k(R + P)}{L\theta}\left(e^2(1 - s)(1 - \theta) - \frac{2s\omega}{(P + s^2\omega)}\right) + f(q|s,e)V = 0$$

(see Expression (15)). Denote $A_{e\lambda}$ and $M_{s\lambda}$ as the partials of A_e and M_s with respect to a given parameter λ. We begin by constructing the Jacobian, **J**, of second-order partials:

$$\mathbf{J} = \begin{bmatrix} A_{ee} & A_{es} \\ M_{se} & M_{ss} \end{bmatrix}.$$

To find the derivatives of e and s with respect to a parameter λ, we compute the vector:

$$W_{\lambda} = [-A_{e\lambda} - M_{s\lambda}] \text{ so that the vector } \begin{bmatrix} \frac{de}{d\lambda} & \frac{ds}{\lambda} \end{bmatrix} = W_{\lambda} \cdot \mathbf{J}^{-1}.$$

Thus we have:

$$\mathbf{J}^{-1} = \begin{bmatrix} \dfrac{M_{ss}}{-A_{es}M_{se} + A_{ee}M_{ss}} & \dfrac{-A_{es}}{-A_{es}M_{se} + A_{ee}M_{ss}} \\ \dfrac{-M_{se}}{-A_{es}M_{se} + A_{ee}M_{ss}} & \dfrac{A_{ee}}{-A_{es}M_{se} + A_{ee}M_{ss}} \end{bmatrix}$$

and:

$$W_{\lambda} \cdot \mathbf{J}^{-1} = \begin{bmatrix} \dfrac{A_{es}M_{s\lambda} - A_{e\lambda}M_{ss}}{-A_{es}M_{se} + A_{ee}M_{ss}} & \dfrac{A_{e\lambda}M_{se} - A_{ee}M_{s\lambda}}{-A_{es}M_{se} + A_{ee}M_{ss}} \end{bmatrix}.$$

We know that $-A_{es}M_{se} + A_{ee}\mathrm{M}_{ss} > 0$ because:

(a) A_{ee} is the auditor's second-order condition and it must be negative at the equilibrium point (details that show this are available from the authors upon request).

(b) $M_{ss} < 0$ at $V = 0$.

$$\begin{aligned} M_{ss} &= \frac{k(R+P)}{L\theta}\left(-e^2(1-\theta) - (-1)\frac{2s\omega{*}2s\omega}{(P+s^2\omega)^2} - \frac{2\omega}{(P+s^2\omega)}\right) \\ &\quad + e^2(q-s)f(q|s,e)V \\ &= \frac{k(R+P)}{L\theta}\left(-e^2(1-\theta) - \frac{2\omega(P-s^2\omega)}{(P+s^2\omega)^2}\right) + e^2(q-s)f(q|s,e)V \end{aligned}$$

and at $V = 0$ is:

$$= \frac{k(R+P)}{L\theta}\left(-e^2(1-\theta) - \frac{2\omega(P-s^2\omega)}{(P+s^2\omega)^2}\right) < 0$$

because we assume that $P > \omega$.

(c) $A_{es} < 0$.

$$\begin{aligned} A_{es} &= -2e(1-s)(1-\theta)\left\{1 - \int_{-\infty}^{\infty} f(h|1,e)\Pr(D|h,s,e)dh\right\} \\ &\quad + e(1-s)^2(1-\theta)\frac{d}{ds}\int_{-\infty}^{\infty}\Pr(H|h,s,e)f(h|1,e). \end{aligned}$$

Because:

$$1 - \int_{-\infty}^{\infty} f(h|1,e)\Pr(D|h,s,e)dh = \int_{-\infty}^{\infty} f(h|1,e)(1 - \Pr(D|h,s,e))dh$$
$$= \int_{-\infty}^{\infty} f(h|1,e)(\Pr(H|h,s,e))dh,$$
$$A_{es} < 0 \text{ if } \frac{d}{ds}\int_{-\infty}^{\infty} \Pr(H|h,s,e)f(h|1,e) < 0. \tag{A17}$$

We can rewrite Expression (A17) as:

$$\int_{-\infty}^{\infty} \frac{d}{ds}\left[1 + \frac{\theta}{(1-\theta)}\frac{f(h|s,e)}{f(h|1,e)}\right]^{-1} f(h|1,e)dh \tag{A18}$$
$$= -\int_{-\infty}^{\infty} \frac{d}{ds}\left[\frac{\theta}{(1-\theta)}\frac{f(h|s,e)}{f(h|1,e)}\right]\left[1 + \frac{\theta}{(1-\theta)}\frac{f(h|s,e)}{f(h|1,e)}\right]^{-2} f(h|1,e)dh$$
$$= -\int_{-\infty}^{\infty} \frac{\theta}{(1-\theta)}\frac{1}{f(h|1,e)}\frac{df(h|s,e)}{ds}\left[1 + \frac{\theta}{(1-\theta)}\frac{f(h|s,e)}{f(h|1,e)}\right]^{-2} f(h|1,e)dh$$
$$= -\int_{-\infty}^{\infty} \frac{\theta}{(1-\theta)} e^2 (h - s)\frac{f(h|s,e)}{f(h|1,e)}\left[1 + \frac{\theta}{(1-\theta)}\frac{f(h|s,e)}{f(h|1,e)}\right]^{-2} f(h|1,e)dh \tag{A19}$$

Let $g(h,s) = \left[1 + \frac{\theta}{(1-\theta)}\frac{f(h|s,e)}{f(h|1,e)}\right]^{-2}$.

Expression (A19) becomes:

$$-\int_{-\infty}^{\infty} \frac{\theta e^2}{(1-\theta)}(h - s)\frac{f(h|s,e)}{f(h|1,e)} f(h|1,e)g(h,s)dh$$
$$= -\frac{\theta e^2}{(1-\theta)}\int_{-\infty}^{\infty} g(h,s)(h - s)f(h|s,e)dh. \tag{A20}$$

Note that $\frac{\partial g(h,s)}{\partial h} > 0$ and $g(h,s) > 0$ for all h. Thus $A_{es} < 0$ if:

$$\int_{-\infty}^{\infty} g(h,s)(h - s)f(h|s,e)dh > 0.$$

Define $d_s = g(s,s)$ as the value of g evaluated at $h = s$. Then:

$$d_s\int_{-\infty}^{\infty}(h - s)f(h|s,e)dh = 0, \text{ where}$$
$$-d_s\int_{-\infty}^{s}(h - s)f(h|s,e)dh = d_s\int_{s}^{\infty}(h - s)f(h|s,e)dh > 0$$

because $f(h|s,e)$ is normal and symmetric around $h = s$. Moreover, $d_s > g(h,s)$ for $h < s$ and $d_s < g(h,s)$ for $h > s$ because $g(h,s)$ increases in h. Thus:

$$d_s\int_{-\infty}^{s}(h - s)f(h|s,e)dh < \int_{-\infty}^{s}g(h,s)(h - s)f(h|s,e)dh \text{ and}$$

$$d_s\int_{s}^{\infty}(h - s)f(h|s,e)dh < \int_{s}^{\infty}g(h,s)(h - s)f(h|s,e)dh$$

$$\Rightarrow$$

$$\int_{-\infty}^{\infty}g(h,s)(h - s)f(h|s,e)dh > d_s\int_{-\infty}^{\infty}(h - s)f(h|s,e)dh = 0$$

Therefore, $A_{es} < 0$.

(d) At $V = 0$, $M_{se} > 0$.

$$M_{se} = \frac{k(R + P)}{L\theta}\{2e(1 - s)(1 - \theta)\} + \frac{1}{e}(1 - e^2(q - s)^2)Vf(q|s,e)$$

and at $V = 0$:

$$M_{se} = \frac{k(R + P)}{L\theta}\{2e(1 - s)(1 - \theta)\} > 0.$$

To prove Proposition 2 we focus on changes in the parameter V—the Sarbanes-Oxley parameter found in the manager's expected payoff. We consider how e and s change as V changes from 0 to a positive value. So we have:

$$\begin{bmatrix}\frac{de}{dV} & \frac{ds}{dV}\end{bmatrix} = \begin{bmatrix}\frac{A_{es}M_{sV} - 0}{-A_{es}M_{se} + A_{ee}M_{ss}} & \frac{0 - A_{ee}M_{sV}}{-A_{es}M_{se} + A_{ee}M_{ss}}\end{bmatrix}$$

where:

$$M_{sV} = f(q|s,e) > 0.$$

(1) Thus, as V increases from 0, $\frac{de}{dV} < 0$ and $\frac{ds}{dV} > 0$ and if e_{SOX} is smaller than the e from the basic model, internal control test effort decreases under Sarbanes-Oxley.

(2) If not, then e_{SOX} is the internal control test effort under Sarbanes-Oxley, which is greater than e from the basic model. In this case, Condition (15) determines the change in s and $\frac{\partial s}{\partial e} = -\frac{M_{se}}{M_{ss}} > 0$ and $\frac{ds}{dV} = \frac{\partial s}{\partial e}\frac{de}{dV} + \frac{\partial s}{\partial V} > 0$, where $\frac{\partial s}{\partial V} = -\frac{M_{sV}}{M_{ss}}$. (Intuitively, when V increases from zero, e increases to e_{SOX} and so Expression (15) increases for each value of s. Because M_s decreases in s, s increases).

(3) $\frac{d\alpha}{dV} = -\frac{k(R + P)2s\omega}{\theta L(P + s^2\omega)^2}\frac{ds}{dV} < 0.$

Lemma 1

$$\frac{dE[x(h)]}{ds} < 0 \text{ and } \frac{dE[x(h)]}{de} < 0.$$

From (A11), we see that:

$$\frac{dE[x(h)]}{de} = -e(1 - s)^2 (1 - \theta)\left\{1 - \int_{-\infty}^{\infty} f(h|1,e)\Pr(D|h,s,e)dh\right\} < 0.$$

Next we show that:

$$\frac{dE[x(h)]}{ds} = \int_{-\infty}^{\infty}\left(\frac{dx(h)}{ds}(\theta f(h|s,e) + (1 - \theta)f(h|1,e)) + x(h)\frac{d\theta f(h|s,e)}{ds}\right)dh < 0.$$

First consider:

$$\begin{aligned}\frac{dx(h)}{ds} &= \frac{d\mathrm{Log}(\Pr(D|h,s,e))}{ds} + \frac{d\mathrm{Log}\left(\frac{R + P}{P + s^2\omega}\right)}{ds}\\ &= -\frac{1}{\Pr(D|h,s,e)}(\Pr(D|h,s,e))^2\frac{(1 - \theta)f(h|1,e)}{\theta f(h|,s,e)}(-1)e^2(h - s)\\ &\quad + \frac{P + s^2\omega}{R + P}\frac{R + P}{(P + s^2\omega)^2}(-1)2s\omega\\ &= \frac{e^2(h - s)(1 - \theta)f(h|1,e)}{\theta f(h|,s,e) + (1 - \theta)f(h|1,e)} - \frac{2s\omega}{P + s^2\omega}.\end{aligned}$$

Thus:

$$\begin{aligned}&\int_{-\infty}^{\infty}\left(\frac{dx(h)}{ds}(\theta f(h|,s,e) + (1 - \theta)f(h|1,e))\right)dh\\ &= \int_{-\infty}^{\infty}\frac{e^2(h - s)(1 - \theta)f(h|1,e)}{\theta f(h|,s,e) + (1 - \theta)f(h|1,e)}(\theta f(h|,s,e) + (1 - \theta)f(h|1,e))dh - \frac{2s\omega}{P + s^2\omega}\\ &= \int_{-\infty}^{\infty} e^2(h - s)(1 - \theta)f(h|1,e)dh - \frac{2s\omega}{P + s^2\omega}\\ &= e^2(1 - s)(1 - \theta) - \frac{2s\omega}{P + s^2\omega}.\end{aligned} \tag{A21}$$

This is the manager's equilibrium condition, which is zero in equilibrium (see Expression (A16) above).
Next consider:

$$\begin{aligned}\int_{-\infty}^{\infty} x(h)\frac{d\theta f(h|s,e)}{ds}dh &= \theta\int_{-\infty}^{\infty} x(h)f(h|s,e)e^2(h - s)dh\\ &= \theta\int_{-\infty}^{\infty}\mathrm{Log}(\Pr(D|h,s,e))f(h|s,e)e^2(h - s)dh.\end{aligned}$$

As in Proposition 1, we use integration by parts with:

$$U = \text{Log}(\Pr(D|h,s,e)) \text{ and } V = \theta\int f(h|s,e)e^2\,(h - s)dh = -f(h|s,e).$$

$$\text{Now } DU = -\frac{(1-\theta)f(h|1,e)}{(1-\theta)f(h|1,e) + \theta f(h|s,e)}\,(e^2(1-s)).$$

Thus:

$$\int_{-\infty}^{\infty} x(h)\frac{d\theta f(h|s,e)}{ds}dh = \theta\text{Log}(\Pr(D|h,s,e))(-f(h|s,e))|_{-\infty}^{\infty}$$
$$-\theta\int_{-\infty}^{\infty}\left(-\frac{(1-\theta)f(h|1,e)}{(1-\theta)f(h|1,e) + \theta f(h|s,e)}\,(e^2(1-s))\right)(-f(h|s,e))dh.$$

The first component above is zero (details available upon request) and the second equals:

$$-e^2(1-\theta)(1-s)\int_{-\infty}^{\infty}\Pr(D|h,s,e)f(h|1,e)dh < 0.$$

Consequently, $\frac{dE[x(h)]}{ds} < 0$.

Proof to Proposition 3

(1) Show that $\frac{dE[x(h)]}{dV} < 0$ when $\frac{de}{dV} > 0$; otherwise the sign is unknown.

$$\frac{dE[x(h)]}{dV} = \frac{dE[x(h)]}{ds}\frac{ds}{dV} + \frac{dE[x(h)]}{de}\frac{de}{dV}$$

and $\frac{dE[x(h)]}{ds} < 0$, $\frac{dE[x(h)]}{de} < 0$ from Lemma 1.

(2) The auditor's expected cost:

$$\begin{aligned}
EC &= k + kE[x(h)] + C(e)\\
\frac{dEC}{dV} &= k\frac{dE[x(h)]}{dV} + C'(e)\frac{de}{dv}\\
&= k\left\{\frac{dE[x(h)]}{ds}\frac{ds}{dV} + \frac{dE[x(h)]}{de}\frac{de}{dV}\right\} + C'(e)\frac{de}{dv}\\
&= k\frac{dE[x(h)]}{ds}\frac{ds}{dV} + \left(k\frac{dE[x(h)]}{de} + C'(e)\right)\frac{de}{dV}
\end{aligned}$$

where:

$$k\frac{dE[x(h)]}{ds}\frac{ds}{dV} < 0 \text{ and } k\frac{dE[x(h)]}{de} + C'(e) = 0$$

when $\frac{de}{dV} < 0$; otherwise, $k\frac{dE[x(h)]}{de} + C'(e) > 0$.

Proof to Proposition 4

To find the comparative static with respect to L, we use the same technique as we did in Proposition 2:

$$\begin{bmatrix} \frac{de}{dL} & \frac{ds}{dL} \end{bmatrix} = \begin{bmatrix} \frac{A_{es}M_{sL} - 0}{-A_{es}M_{se} + A_{ee}M_{ss}} & \frac{0 - A_{ee}M_{sL}}{-A_{es}M_{se} + A_{ee}M_{ss}} \end{bmatrix}$$

When $V = 0$ (the benchmark case):

$$M_{sL} = -\frac{k(R+P)}{L^2\theta}\left(e^2(1-s)(1-\theta) - \frac{2s\omega}{(P+s^2\omega)}\right) = 0$$

because $\left(e^2(1-s)(1-\theta) - \frac{2s\omega}{(P+s^2\omega)}\right) = 0$ in the benchmark case.

Thus:

$$\frac{ds}{dL} = 0, \frac{de}{dL} = 0.$$

Also:

$$\alpha = \frac{k(R+P)}{\theta L(P+s^2\omega)} \text{ and } \frac{d\alpha}{dL} = -\frac{k(R+P)}{\theta L^2\,(P+s^2\omega)} < 0.$$

When $V > 0$:

$$M_{se} = \frac{k(R+P)}{L\theta}\,\{2e(1-s)(1-\theta)\} + \frac{1}{e}\,(1 - e^2\,(q-s)^2)Vf(q|s,e) > 0$$

when $q \in [0,1]$ and R or P is large (details available from the authors upon request). This is a sufficient (not necessary) condition and all our numerical examples have shown that this sign holds for all values of $R > P > \omega$.

In addition:

$$M_{ss} = \frac{k(R+P)}{L\theta}\left(-e^2\,(1-\theta) - \frac{2\omega(P - s^2\omega)}{(P+s^2\omega)^2}\right) + e^2(q-s)f(q|s,e)V < 0$$

when R or P is large (details available from the authors upon request). Again this is a sufficient (not necessary) condition and all our numerical examples have shown that this signs holds for all values of $R > P > \omega$.

$$M_{sL} = -\frac{k(R+P)}{L^2\theta}\left(e^2\,(1-s)(1-\theta) - \frac{2s\omega}{(P+s^2\omega)}\right) > 0$$

because $e^2(1-s)(1-\theta) - \frac{2s\omega}{(P+s^2\omega)} < 0$ when $V > 0$.

Thus:

$$\frac{ds}{dL} > 0, \frac{de}{dL} < 0 \text{ when } e > e_{SOX}.$$

As before,

$$\alpha = \frac{k(R + P)}{\theta L(P + s^2\omega)} \text{ and } \frac{d\alpha}{dL} = -\frac{k(R + P)}{\theta L^2 (P + s^2\omega)} < 0.$$

Proof to Proposition 5

When the equilibrium e under Sarbanes-Oxley is greater than e_{SOX}:

$$\begin{bmatrix} \frac{de}{dq} & \frac{ds}{dq} \end{bmatrix} = \begin{bmatrix} \frac{A_{es}M_{sq} - 0}{-A_{es}M_{se} + A_{ee}M_{ss}} & \frac{0 - A_{ee}M_{sq}}{-A_{es}M_{se} + A_{ee}M_{ss}} \end{bmatrix}$$

where:

$$M_{sq} = e^2 (s - q)f(q|s,e)V > 0 \text{ when } s > q\text{; otherwise:}$$
$$M_{sq} = e^2 (s - q)f(q|s,e)V < 0.$$

Thus:

$$\frac{ds}{dq} > 0, \frac{de}{dq} < 0 \text{ when } s > q\text{; otherwise, } \frac{ds}{dq} < 0, \frac{de}{dq} > 0.$$

When e under Sarbanes-Oxley is equal to e_{SOX} because e in the benchmark is less than e_{SOX}, $\frac{ds}{dq} = -\frac{M_{sq}}{M_{ss}} > 0$ when $s > q$; otherwise, $\frac{ds}{dq} < 0$.

REFERENCES

American Institute of Certified Public Accountants (AICPA). 1995. *Consideration of Internal Control in a Financial Statement Audit.* SAS No. 78. New York, NY: AICPA.

———. 2002. *The Consideration of Fraud in a Financial Statement Audit.* SAS No. 99. New York, NY: AICPA.

Ashbaugh, H., D. Collins, and W. Kinney. 2005. The discovery and consequences of internal control deficiencies prior to SOX-mandated audits. Working paper, The University of Iowa.

Beneish, M. D., M. B. Billings, and L. D. Hodder. 2006. Internal control weaknesses and information uncertainty. Working paper, Indiana University.

Caplan, D. 1999. Internal controls and the detection of management fraud. *Journal of Accounting Research* 37 (1): 101–117.

Cohen, D. A., A. Dey, and T. Z. Lys. 2005. Trends in earnings management in the pre- and post-Sarbanes Oxley periods. Working paper, Northwestern University.

Controller's Report. 2005a. *2005 SOX fees to Hit 60% or More of Audit Costs for Most Companies.* April. New York, NY: Institute of Management & Administration, Inc.

———. 2005b. *Sarbanes-Oxley Compliance.* August. New York, NY: Institute of Management & Administration, Inc.

CRA, International. 2005. *Sarbanes-Oxley Section 404 Costs and Implementation Issues: Survey Update*. Washington, D.C.: Charles River Associates International.

Doyle, J., W. Ge, and S. McVay. 2005. Accruals quality and internal control over financial reporting. Working paper, University of Michigan.

Hogan, C. E., and M. S. Wilkins. 2006. Evidence on the audit risk model: Do auditors increase audit effort in the presence of internal control weaknesses. Working paper, Southern Methodist University.

Matsumura, E., and R. Tucker. 1992. Fraud detection: A theoretical foundation. *The Accounting Review* 67 (4): 753–782.

Patterson, E. R., and J. C. Noel. 2003. Audit strategies and multiple fraud opportunities of misreporting and defalcation. *Contemporary Accounting Research* 20 (3): 519–549.

Public Company Accounting Oversight Board (PCAOB). 2005a. *Report on the Initial Implementation of Auditing Standard No. 2, An Audit of Internal Control over Financial Reporting Performed in Conjunction with an Audit of Financial Statements.* Release No. 2005-009. May 16. Washington, D.C.: PCAOB.

———. 2005b. *Report on the Initial Implementation of Auditing Standard No. 2, An Audit of Internal Control over Financial Reporting Performed in Conjunction with an Audit of Financial Statements.* Release No. 2005-023. November 30. Washington, D.C.: PCAOB.

Roberts, C. R. 2006. Under the spotlight of SOX. *Knight Ridder Tribune Business News* (July 23): 1.

Smith, R., S. Tiras, and S. Vichitlekarn. 2000. Internal control assessment and substantive testing in audits for fraud. *Contemporary Accounting Research* 17 (2): 327–356.

THE ACCOUNTING REVIEW
Vol. 82, No. 2
2007
pp. 457–481

Earnings, Cash Flows, and *Ex Post* Intrinsic Value of Equity

K. R. Subramanyam
University of Southern California

Mohan Venkatachalam
Duke University

ABSTRACT: We reexamine the relative importance of earnings and operating cash flows in equity valuation. In contrast to previous studies that use stock returns (Dechow 1994) or future operating cash flows (Barth et al. 2001), we use *ex post* intrinsic value of equity as the criterion for comparison. We determine *ex post* intrinsic value of equity by discounting future dividends over a three-year horizon and market price at the end of the horizon by industry cost of equity. The advantage of the *ex post* intrinsic value measure over stock returns is that it is not contaminated by the stock market's fixation on reported earnings (Sloan 1996). Also, unlike finite horizon future operating cash flows, *ex post* intrinsic values better reflect the magnitude, timing, and uncertainty of investors' future cash flows (SFAC No. 1, FASB 1978). Our results suggest that accrual-based earnings dominate operating cash flows as a summary indicator of *ex post* intrinsic value.

Keywords: *earnings; cash flows; value relevance; intrinsic value; deflator.*

Data Availability: *All data used in the study are available from public sources.*

I. INTRODUCTION

A fundamental question in accounting is the relative ability of accrual-based earnings and cash flows to predict a firm's ability to generate future cash flows. However, despite extensive research, the relative superiority of cash flows versus earnings as *summary* predictors of future cash flows remains largely unresolved.[1] We contribute to this important debate by examining the relative ability of earnings and cash flows in explaining *ex post* intrinsic value of equity. We determine *ex post* intrinsic values using the dividend

---

[1] It is less controversial that both accruals and operating cash flows provide incremental information beyond each other. For example, both accruals and operating cash flows have incremental information content in explaining stock returns (Rayburn 1986; Bowen et al. 1987; Ali 1994) and future operating cash flows (Barth et al. 2001; Burgstahler et al. 1999).

We thank Bill Beaver, Jean Bedard, Dave Burgstahler, Dan Dhaliwal (the editor), Peter Easton, Jennifer Francis, Karen Nelson, Per Olsson, Ken Singleton, two anonymous reviewers, and seminar participants at the University of Wisconsin–Madison for their valuable comments. We thank Yulin Long for research assistance. We appreciate financial support from Marshall School of Business at the University of Southern California and Fuqua School of Business, Duke University.

Editor's note: This paper was accepted by Dan Dhaliwal.

Submitted August 2005
Accepted June 2006

discount model. As inputs to the model we use *ex post* (future) dividends over a three-year horizon and market value at the end of the forecast horizon as terminal value and discount these payoffs using industry cost of equity. Our *ex post* intrinsic value approach overcomes limitations with extant methods using stock price/returns (e.g., Dechow 1994) or future operating cash flows (e.g., Barth et al. 2001). Consistent with FASB's claim (SFAC No. 1, FASB 1978, para. 44), we show that accrual-based earnings dominate operating cash flows in explaining *ex post* intrinsic value.

Prior research adopts two different approaches to investigate the relative importance of earnings and cash flows for equity valuation. Several studies examine the relative ability of earnings and cash flows in predicting future operating cash flows over finite horizons (often just one year). While some of the earlier studies under this genre (Greenberg et al. 1986; Bowen et al. 1986) document mixed results, recent studies (e.g., Barth et al. 2001; Burgstahler et al. 1999) unambiguously document the superiority of operating cash flows over earnings in predicting future operating cash flows over varying horizons.[2] However, the use of a finite set of operating cash flows as a surrogate for firm value (i.e., investors' future cash realizations) has certain limitations. Operating cash flows are not value attributes because they ignore investments in operating assets—the appropriate value attribute is free cash flows (Copeland et al. 2000). More importantly, a finite set of future cash flows does not capture a large proportion of the firm's intrinsic value that is represented by the terminal value (Palepu et al. 2000).[3]

Another set of studies (e.g., Dechow 1994) examine the ability of stock price as a proxy for fundamental equity value and document that earnings are superior to cash flows in explaining contemporaneous stock prices or returns. An implicit assumption in such studies is that stock prices accurately reflect future-cash-flow information contained in current earnings and current operating cash flows. However, evidence in Sloan (1996) suggests that stock market participants appear to fixate on current earnings without considering the differential persistence of its accrual and cash flow components. Thus, it is not clear whether the superior explanatory power of earnings (vis-à-vis cash flows) for returns arises because of the ability of earnings to better reflect value-relevant information or because of the stock market's fixation on bottom line earnings.

We adopt a different approach to examine this important question. Specifically, we examine the relative ability of earnings and cash flows in explaining *ex post* intrinsic values. We measure *ex post* intrinsic value by using the dividend discount model. Since the purpose of our study is to evaluate the predictive ability of earnings and cash flows, we use *ex post* realizations of dividends as inputs to the valuation models (e.g., Penman and Sougiannis 1998) rather than their *ex ante* expectations (e.g., Francis et al. 2000). Using *ex ante* expectations such as analyst forecasts to determine intrinsic value may not be appropriate because analysts also appear to fixate on current earnings (Bradshaw et al. 2001). To capture payoffs beyond the three-year horizon, we estimate terminal value using market value at the end of the horizon. Since the anomalous pricing of the accrual and cash flow components of earnings does not persist beyond two years (Sloan 1996; Xie 2001), the intrinsic value measure—unlike current returns or stock price—are unlikely to be biased by market mispricing (see Aboody et al. 2002). Furthermore, unlike examining a finite set of future cash flows, *ex post* intrinsic values accurately measure the future cash flow realizations of investors. Thus, the *ex post* intrinsic value methodology overcomes inference problems associated with both the future-operating-cash-flows and stock-price/returns methodologies.

---

[2] The primary thrust of Barth et al. (2001) is to show that *components* of earnings are informative in predicting future operating cash flows. However, they report that "Similar to Burgstahler et al. (1998), for our large sample of firms we find that current cash flow has more predictive ability for future cash flows than current aggregate earnings. However, we leave to future research clear resolution of the mixed findings of prior research."

[3] Both Barth et al. (2001) and Burgstahler et al. (1999) examine the ability of earnings and cash flows in predicting discounted *ex post* operating cash flows. Additionally, Barth et al. (2001) also estimate terminal values by extrapolating terminal cash flows at an assumed growth rate. However, their discounted measures are not indicative of intrinsic value for two reasons. First, they discount *operating* cash flows and not *free* cash flows, and, hence, ignore investments. Second, their terminal value measures are mere extrapolations of the terminal operating cash flows. Thus, their terminal values do not add any new information beyond that already present in the finite stream of *ex post* cash flows.

We conduct our analysis using data available post-1987 in the Compustat database for which *ex post* intrinsic values can be determined. We use both undeflated and deflated (using shares outstanding and total assets as alternative deflators) specifications to examine the relation between earnings, operating cash flows and intrinsic value. Results from undeflated and shares outstanding-deflated (per-share) specifications unambiguously document the superiority of earnings over operating cash flows in explaining *ex post* intrinsic values. Specifically, R^2s from models with earnings as the independent variable are significantly higher than R^2s from models with cash flows as the independent variable. However, total-assets-deflated results present inference problems because coefficient estimates for the relation between intrinsic values (or market values) and both earnings and cash flows are negative. The anomalous negative coefficients arise because of the large proportion of negative earnings/operating cash flows in our sample.[4] We address this problem by replicating our analyses on a subsample of firms with only positive realizations of earnings and operating cash flows. Results from this subsample suggest that current earnings dominate operating cash flows in explaining *ex post* intrinsic values.

While the *ex post* intrinsic-value method clearly addresses problems with the future-operating-cash-flows-prediction approach, it is less obvious whether our methodology is able to differentiate and overcome problems associated with using contemporaneous stock price/returns as the prediction criterion. For example, the estimated intrinsic value measures are significantly correlated with current market values. Consequently, it is not certain that *ex post* intrinsic values are uncontaminated by mispricing of current accruals and operating cash flows, since we use three-year-ahead stock price for determining terminal values. Therefore, we conduct additional analyses to ensure that our results are not contaminated by accruals' mispricing and that our approach is distinct from the stock-returns' approach. Specifically, we show that our results hold in the third of the sample with the largest deviations between market value and intrinsic value. We also show that for firms with extreme accruals, i.e., where accruals mispricing is most likely, the extent to which earnings dominates cash flows is substantially lower when intrinsic value is the dependent variable than when market value is the dependent variable, suggesting that the bias in stock prices arising from mispricing of accruals is largely ameliorated when intrinsic values are used.

Our study makes the following contributions to the literature. First, we provide further evidence on an important question that has remained unresolved in the prior literature. We show that, consistent with FASB's claim, earnings are superior predictors of investors' future cash flow realizations than are operating cash flows. Second, several researchers have used and continue to use a finite set of future operating cash flows as proxies for future cash flow expectations of investors (e.g., Barth et al. 2001; Kim and Kross 2005). We argue that drawing inferences from using such a finite horizon of future payoffs can be problematic, and propose an alternative method—using *ex post* intrinsic values—that is theoretically and operationally superior.[5] Third, our method is immune to short-term mispricing by the stock markets that could contaminate tests based on contemporaneous stock price/returns (also see Aboody et al. 2002). Finally, our study makes an important methodological contribution with respect to deflation. Prior research (e.g., Easton 1998; Brown et al. 1999) suggests deflation as a potential remedy to scale bias inherent in levels regressions. We show that deflation *per se* can introduce coefficient bias in price-earnings regressions especially when a significant proportion of negative earnings observations is present.

---

[4] The anomalous negative relationship is present for our deflated specifications even when we use stock prices as our dependent variable. The reason for these anomalous results is as follows. Note that the relation between negative earnings and price is anomalous and negative (e.g., Jan and Ou 1995; Collins et al. 1999). Deflation induces firms with negative earnings or cash flows to assume large weights in the regression, which results in negative coefficients for the entire sample (of both positive and negative earnings). We provide a detailed technical discussion of this issue in the Appendix.

The paper proceeds as follows. In the next section, we outline the debate on the relative importance on earnings and cash flows and motivate our *ex post* intrinsic value approach. Section III describes the measurement of variables and the sample. Section IV presents findings from preliminary analyses and Section V presents our main findings using *ex post* intrinsic value measures. In Section VI we conduct several additional analyses to differentiate our results from that using stock prices/returns. Section VII concludes.

II. MOTIVATION

The Cash Flows versus Earnings Debate

The accrual concept forms the cornerstone of modern accounting. Accounting standard-setters maintain the superiority of accrual-based earnings over cash flows, as a *summary* indicator of the firm's financial performance. For example, the FASB's Statement of Accounting Concepts (SFAC) No. 1 (FASB 1978, para. 44) asserts: "Information about an enterprise's earnings based on accrual accounting generally provides a better indication of enterprise's present and continuing ability to generate favorable cash flows than information limited to the financial aspects of cash receipts and payments." Accrual-based earnings is hypothesized to overcome both timing and mismatching problems inherent in cash flows, thus making it a more relevant summary indicator of a firm's value and financial performance (Dechow 1994). However, accruals are also fraught with measurement error due to the assumptions underlying the determination of accruals and the discretion allowed under Generally Accepted Accounting Principles (GAAP). This often evokes strong criticism and suspicion from many economists and financial analysts on the relevance of earnings for valuation (e.g., Copeland et al. 2000). Given this debate, one of the most important questions in accounting and financial analysis is the role of accruals in generating a summary indicator of firm value or performance. As Schipper (1989) observes: "one of the central questions confronted by practicing professional accountants and academic accountants [is] the influence and importance of accounting accruals in arriving at a summary measure of financial performance." Our paper is an attempt to offer evidence pertinent to this important question.

Several studies directly test FASB's assertion regarding accrual accounting's superiority by examining the relative abilities of earnings and operating cash flows for predicting a firm's future operating cash flows. While some of the earlier studies (Greenberg et al. 1986; Bowen et al. 1986) document mixed results, recent studies (for example, Barth et al. 2001;

---

[5] For example, we show that inferences regarding the superiority of earnings versus cash flows reverse depending on whether future operating cash flows or future earnings is the predictive criterion. To further buttress our argument, we also reexamine the results of Kim and Kross (2005) and find (results not reported) that the temporal increase in earnings' correlation with one-period ahead operating cash flows that they document reverses when intrinsic values are used as the predictive criterion. Results of this analysis are available from the authors upon request.

Burgstahler et al. 1999) use a more accurate measure of operating cash flows (direct operating cash flow measures under SFAS No. 95) over much larger samples and unambiguously document the superiority of operating cash flows over earnings in predicting future operating cash flows.

The motivation for using future operating cash flows as the predictive criterion arises from the primary objective of financial reporting, which is the prediction of the magnitude, timing, and uncertainty of prospective future cash flows (SFAC No. 1, FASB 1978, para. 37). However, the use of short-horizon future operating cash flows as the predictive criterion is problematic for several reasons. First, according to FASB, the primary objective of financial reporting is the prediction of future cash receipts to *users* of accounting information. The prediction of the *firms'* cash flows assumes importance only because users' cash inflows are related to the firms' ability to generate cash (FASB 1978, para. 37).[6] From the perspective of equity investors, for example, the overarching objective of financial reporting is to provide information that helps them determine the present value of all future cash receipts from their investments in firms' equity—i.e., dividends and proceeds from sale of stock—which is parsimoniously represented by the *intrinsic value* of the firm's equity. Second, while operating cash flows may be correlated with intrinsic value, there are at least two reasons why a finite set of future operating cash flows is an inappropriate substitute for the firms' intrinsic value. First, a finite set of future cash flows measures only a small portion of a firm's intrinsic value. A significant fraction of firm value is determined by the terminal value even when the forecast horizon is as long as ten years (Palepu et al. 2000; Copeland et al. 2000). Second, *operating* cash flows are not value attributes. This is because operating cash flows ignore investments in operating assets; the appropriate value attribute is *free* cash flows (Copeland et al. 2000). Finally, as we show later in this paper, inferences reverse when the predictive criterion is switched to future earnings. That is, *earnings* outperform operating cash flows in predicting future earnings. Since neither future earnings nor future operating cash flows are strictly value attributes—but both have been used in extant research as *ad hoc* predictive criteria—the contradictory results make it difficult to draw unambiguous inferences regarding the relative superiority of earnings and cash flows in predicting investors' future cash flows.[7]

An alternative approach to examining the relative superiority of earnings versus cash flows is through the use of stock prices (returns) to proxy for investors' expectations about future cash flows. For example, Dechow (1994) documents that accrual-based earnings are superior to cash flows in explaining cross-sectional variation in stock returns over various horizons. Stock prices are estimates of intrinsic value and therefore parsimoniously aggregate investors' future cash flow expectations. Therefore, the stock-price (returns) approach is free of problems that arise when examining the association with finite-horizon future operating cash flows. A maintained assumption under this approach is that the stock market is efficient and appropriately incorporates the economic implications of accrual and cash flow components of earnings. However, evidence in Sloan (1996) and Xie (2001) suggests that the stock market fixates on accounting earnings and, hence, fails to fully incorporate the differential future-cash-flow implications of the accrual and cash flow components of earnings. In light of this evidence, unambiguous inferences regarding the relative superiority of earnings versus cash flows in predicting future cash flows are not possible when using stock price (returns) as the predictive criterion.[8]

---

[6] That the prediction of cash flows to the enterprise is derived from the more fundamental objective of prediction of cash flows to the investors (or creditors) is evident from paragraph 37 of FASB's Statement of Financial Accounting Concepts (SFAC) No. 1, which states: "Financial reporting should provide information to help present and potential investors and creditors and other users in assessing the amounts, timing, and uncertainty of prospective cash receipts from dividends or interest and the sale, redemption, or maturity of securities or loans. The prospect for those cash receipts are affected by an enterprise's ability to generate enough cash to meet its obligations when due and its other cash operating needs, to reinvest in operations, and to pay cash dividends and may also be affected by perceptions of investors and creditors generally about that ability, which affect market prices of the enterprise's securities. Thus financial accounting should provide information to help investors, creditors and others assess the amounts, timing and uncertainty of prospective cash inflows to the related enterprise" (FASB 1978, para. 37).

[7] Barth et al. (2001) and Kim and Kross (2005) are examples of papers that use future operating cash flows, while Ou and Penman (1989) and Dhaliwal et al. (1999) are examples of papers that use future earnings.

Dechow (1994) controls for possible market mispricing by also using an alternative returns measure that includes future returns to evaluate the relative importance of earnings and cash flows. However, she reports the future-returns' analysis merely as a sensitivity test and much of the related discussion is relegated to a footnote in her paper (Dechow 1994, footnote 16). This sensitivity analysis has not been appreciated by subsequent researchers who continue to view the earnings/cash flows debate as largely unresolved. For example, Barth et al. (2001, 30) observe: "Prior research provides evidence that share prices fail to reflect accurately the differential persistence of accruals and cash flows ... this evidence calls into question the use of share prices as a proxy for expected future cash flows when examining the predictive ability of accruals and cash flows."[9]

Ex Post Intrinsic Value Approach

We investigate the relative ability of the two summary measures, earnings and cash flows, in explaining *ex post* intrinsic value of equity. *Ex post* intrinsic value is the present value of all future payoffs to the equity investor. Specifically, it is measured as the present value of future three years of dividends and a terminal dividend captured by the stock price at the end of three years. The use of intrinsic values simultaneously overcomes problems inherent in using future operating cash flows or stock returns as the predictive criteria. By incorporating future dividends and stock price at the end of the horizon, the intrinsic value measure provides a more accurate measure of the users' (investors') future cash flow realization than a finite horizon of future operating cash flows. Using *ex post* market values rather than estimated terminal values has several advantages. First, *ex post* market values accurately portray the future payoffs to an investor. Second, *ex post* market value is devoid of *ad hoc* assumptions (such as terminal year payoffs and perpetual growth rates) that are necessary in estimating terminal values. Third, terminal values that extrapolate from the finite series of earnings (or cash flows) will suffer from the same limitations as the finite-horizon payoffs' prediction models, since the terminal values are mere projections of the information contained in the finite payoffs.[10] While it is possible that market prices at the end of the forecast horizon may be incorrectly priced, such mispricing is unlikely to be associated with current period cash flows and earnings. This is because we use three-years-ahead market values and the anomaly identified by Sloan (1996) does not persist beyond two years.[11] In this manner, the *ex post* intrinsic value approach also overcomes limitations with the stock price/returns approach.

---

[8] Subsequent evidence in Thomas and Zhang (2002) and Desai et al. (2004) suggest that the accrual/cash flow mispricing identified by Sloan (1996) is unlikely due to functional fixation on earnings. However, as long as markets incorrectly price accruals and cash flows, irrespective of the underlying reason, use of stock price can lead to incorrect inferences.

[9] Kim and Kross (2005, 754) also motivate the use of future operating cash flows by noting that share prices may be inefficient.

[10] For example, Barth et al. (2001) also use discounted *ex post* operating cash flows in some of their tests, with terminal value computed by extrapolating terminal cash flows at an assumed growth rate. However, such an approach adds little beyond the use of finite future cash flows because the terminal value is a linear projection of information contained in the finite cash flows. Results presented in Table 2 provide support for this argument. Moreover, such an approach represents a significant departure from traditional valuation models that discount free cash flows as opposed to operating cash flows.

We need, however, to acknowledge certain limitations of the *ex post* intrinsic value approach. First, we need to caution that using intrinsic value as the predictive criterion is superior to that using future operating cash flows only from the perspective of the equity investor. Arguably, the equity investor constitutes the most important class of users of financial statements. However, as Holthausen and Watts (2001) point out, equity investors are not the only user group. For example, creditors are an important class of users and their information needs may differ from that of investors. Since intrinsic values mirror the cash receipts of investors, we do acknowledge that our results may not necessarily apply to information needs of other types of users. For example, current and future operating cash flows may be useful to creditors by providing information about default risk, in a manner that is independent of its ability to map into the intrinsic value of equity. Second, since we use three-year-ahead market value for the terminal value, a reader may argue that the *ex post* intrinsic value measure is not entirely independent of accruals' mispricing. Finally, the intrinsic value approach is especially problematic when earnings and cash flows are negative. Because the valuation relation is unclear when the performance measures are negative, the relative superiority of earnings and cash flows can be examined only in the positive quadrants of the two performance measures.

III. METHODOLOGY, SAMPLE, AND DESCRIPTIVE STATISTICS

Intrinsic Value Measurement

To determine intrinsic value we use the fundamental valuation equation, the dividend discount model (DDM) originally proposed by Preinreich (1938). As Ohlson (1989) shows, assuming the no-arbitrage condition, we get the following identity:

$$P_t = \rho^{-1}E(d_{t+1}) + \rho^{-1}E(P_{t+1}) \tag{1}$$

where P_t is the stock price at time t, d_{t+1} represents dividend at period $t+1$, ρ is 1 plus the discount rate, and E is the market expectation operator at time t. This expression represents the price of a stock for an investor with a one-period horizon. Iteratively substituting for forward prices, we obtain the following finite-horizon expression for price:

$$P_t^N = \sum_{i=1}^{N}\rho^{-i}E(d_{t+i}) + \rho^{-N}\,E(P_{t+N}) \tag{2}$$

where N is the number of years in the finite horizon. Note that the above finite-horizon expression can be extended to an infinite horizon to generate the popular dividend discount formulation.

To derive a measure of *ex post* intrinsic value we replace expected dividends and price in the finite period formulation by their respective *ex post* realizations:

---

[11] We also conduct several additional tests that suggest that using intrinsic values reduce biases stemming from market mispricing of accruals. See Section VI.

$$IV_t^N = \sum_{i=1}^{N} \rho^{-i}(d_{t+i}) + \rho^{-N}(P_{t+N}). \tag{3}$$

As in Penman and Sougiannis (1998), we compute *ex post* intrinsic values (*IV*) using a three-year horizon.[12] Dividends are defined as the sum of common dividends (Compustat data item 21) and cash distributions from stock repurchases (change in Compustat data item 226). We compute dividends on a per-share basis using shares outstanding (Compustat data item 25) that are adjusted for stock splits and stock dividends. For stock prices we use fiscal-year-end stock price obtained from Compustat (data item 199). While our primary tests use a three-year horizon, we replicate all our analyses using a five-year horizon and find qualitatively similar results.

We estimate discount rates using the following industry cost of equity (see Francis et al. 2000):

$$\rho - 1 = r_f + \beta[E(r_m) - r_f] \tag{4}$$

where r_f is a one-month treasury bill rate, and β is systematic risk for the industry to which a firm belongs. We compute industry betas by averaging firm-specific betas for all sample firms in each two-digit SIC codes. Firm-specific betas are calculated using daily returns data over fiscal year $t-1$. As with prior research (Francis et al. 2000; Copeland et al. 2000), we use 6 percent as the market risk premium $[E(r_m) - r_f]$.

We acknowledge that estimating discount rates is susceptible to measurement error. Accordingly, in separate sensitivity analysis, we use the following alternative measures of discount rates: (1) firm-specific discount rates (rather than industry averages); (2) industry average discount rates measured with 3 percent market risk premium, instead of 6 percent; and (3) constant rates of 10 percent and 12 percent. Our results (not reported) are qualitatively similar using these alternative discount rates.

Sample and Descriptive Statistics

We compute intrinsic values for a sample of all available firms in the 2004 Compustat database for the period 1988–2000. We restrict the analysis to this time period for two reasons. First, operating cash flow measures using balance sheet information are known to suffer from significant measurement error (Hribar and Collins 2002). Therefore, we confine our analysis to firm-years starting from 1988 when SFAS No. 95 reported operating cash flow information became available. Second, at least three subsequent years of data are required to compute intrinsic values—this limits our sample to years 2000 and earlier. We delete all firm-years with negative book value of equity and delete firm-years where any of the key variables are in the extreme 1 percent of their respective distributions. Our final sample consists of 45,395 firm-year observations representing 7,840 distinct firms.[13] Finally, our sample also includes the market downturn that occurred around 2000. As a sensitivity check we replicate our results excluding 2000 and find qualitatively similar results.

---

[12] Since we use *ex post* realizations of market value at the end of the forecast horizon, intrinsic value measures using alternative approaches such as the residual income model will be algebraically identical. However, empirical estimates will be different largely because of errors in measuring inputs to the models. For example, in determining the intrinsic value using the residual income model, measurement error in earnings arises because reported net income does not strictly adhere to clean surplus. As a sensitivity check, we also consider intrinsic values calculated using the residual income model and our inferences are unchanged.

[13] Note that our sample sizes vary because of different deflators. While we have 45,395 observations for the undeflated specification, the Per-Share specification has 44,943 observations and the total-assets-deflated specification has 45,020 observations.

Table 1, Panel A provides descriptive information regarding the dependent and independent variables. For our empirical analysis we consider both undeflated and deflated (separately by shares outstanding [Compustat data item 25] and total assets [Compustat data item 6]) specifications.[14] Hence, we report descriptive statistics in both undeflated and deflated forms. Earnings (*EARN*) is defined as income before extraordinary items (Compustat data item 123). Operating cash flow (*OCF*) is defined as net cash flow from operating activities (Compustat data item 308) obtained from the cash flow statement adjusted for extraordinary items and discontinued operations (Compustat data item 124). Table 1 reports that the mean and median *EARN* are lower than that of *OCF* in both deflated and undeflated forms mainly because of depreciation and amortization. We compute the undeflated market value of equity (*MKTV*) as the fiscal year-end price per share (Compustat data item 199) multiplied by shares outstanding (Compustat data item 25). To be comparable, we convert

TABLE 1
Descriptive Statistics and Correlation Matrix[a]

Panel A: Descriptive Statistics[b]

Variable	Deflator	Mean	Median	Std. Dev.	Skewness
OCF	Undeflated ($ m)	84.85	6.51	255.12	5.52
	Per-Share	1.43	0.79	2.10	1.64
	Total Assets	0.05	0.07	0.13	−1.92
EARN	Undeflated ($ m)	41.75	3.68	129.22	4.99
	Per-Share	0.66	0.49	1.23	0.54
	Total Assets	0.01	0.04	0.14	−2.78
MKTV	Undeflated ($ m)	875.15	111.38	2404.48	5.41
	Per-Share	16.15	11.50	15.03	1.49
	Total Assets	1.43	0.91	1.55	2.87
IV	Undeflated ($ m)	875.58	91.58	2508.34	5.62
	Per-Share	16.50	9.36	19.25	2.06
	Total Assets	1.37	0.76	1.81	3.33

Panel B: Pearson Correlation Statistics[c]

	Undeflated	Per-Share	Deflated by Total Assets
Corr (*MKTV*, *IV*)	0.87	0.70	0.52

[a] Sample comprises all firm-years in the 2004 Compustat database with available data: 45395, 44943, and 45020 firm-years for the undeflated, per-share, and total-assets-deflated specifications, respectively.

[b] *OCF* represents operating cash flows (Compustat data item 308 − Compustat data item 124); *EARN* represents income before extraordinary items (Compustat data item 123); *MKTV* represents market value of equity (Compustat data item 199 * Compustat data item 25); and *IV* represents intrinsic values using the dividend discount model for a three-year horizon with market value of equity at the end of the third year as terminal value. The discount rate used is the two-digit SIC industry cost of capital. The deflators, shares outstanding and total assets, are Compustat data items 25 and 6, respectively.

[c] All correlation coefficient estimates are statistically significant at the 0.01 level (two-tailed).

---

[14] Regressions using undeflated variables are well known to cause scale and heteroscedasticity problems (Easton and Sommers 2003). Because we compare the explanatory power between two regression specifications, any scale and heteroscedasticity effects apply to both equations and, hence, we argue that the relative bias should be minimal. Nonetheless, we consider several alternative deflators to ensure robustness of our findings. In addition to the reported Per-Share and total assets deflation we also consider deflation by book value and lagged market value and find that results are qualitatively similar to results obtained for the total assets deflation.

the per-share intrinsic values into dollar amounts by multiplying per-share intrinsic values with current shares outstanding (for the undeflated analysis). The mean of market value (*MKTV*) is similar to that of the intrinsic value (*IV*), while the medians of *MKTV* are higher than those of the intrinsic values for all three deflators. Panel B presents correlations between market values and intrinsic values. While the market values and intrinsic values are highly correlated for the undeflated specification ($\rho = 0.87$), the correlation is much lower ($\rho = 0.70$ and 0.52) when the variables are deflated.

IV. PRELIMINARY ANALYSES

Initially, we present evidence on the relative explanatory power of earnings and operating cash flows for contemporaneous market values, future operating cash flows, and future earnings. Largely, this analysis is similar to that in prior research such as Dechow (1994), Barth et al. (2001), and Burgstahler et al. (1999). Nevertheless, we present these results for the following reasons. First, we are able to verify whether our results are consistent with those in previous research. Second, we show that inferences reverse when we alternatively use future operating cash flows and future earnings as predictive criterion. Finally, the contemporaneous market value analysis allows us to identify and describe certain peculiarities in our data that create inference problems in our total-assets-deflated models. This issue is important because similar data problems occur when using intrinsic values.

Explanatory Power for Market Value of Equity

Panel A of Table 2 reports the explanatory power of pooled undeflated, per-share, and total-assets-deflated regressions of contemporaneous market value on earnings and operating cash flows. In undeflated and per-share regressions, the R^2s of *EARN* (undeflated = 69.7 percent; per-share = 39.9 percent) are significantly higher than that of *OCF* (undeflated = 64.3 percent; per-share = 33.8 percent) and the Vuong (1989) statistics for the differences are significant at the 1 percent level. We also estimate regressions separately for each year and find that earnings have significantly higher explanatory power (Vuong statistic significant at the 10 percent level or better) in at least 10 out of the 13 years examined (reported in square brackets in the table).

In the total-assets-deflated models, notice that the coefficients on earnings and cash flows are negative, which is contrary to expectation. This makes the explanatory power from these models non-interpretable. The anomalous negative coefficients for both *CFO* and *EARN* in the total-assets-deflated specification underscores a basic problem with our full sample regressions. As discussed earlier, our sample contains a significant proportion (about 25 percent) of negative realizations of *EARN* and *OCF*. Negative earnings (or cash flows) create both theoretical and empirical problems in price-earnings (or price-cash flow) regressions.

Theoretically, the price-earnings relation is unspecified for negative earnings. For example, in Hayn's (1995) liquidation-option framework, earnings are unrelated to price when earnings are below the level where the liquidation option is triggered and linearly increasing after that level. Since it is reasonable that firms with negative earnings or cash flows are more likely to trigger the liquidation option than positive earnings/cash flow firms, Hayn's (1995) framework suggests that the price-earnings (or price-cash flow) relation is flat in the negative quadrant and increasing in the positive quadrant.[15] Empirically, however, market value is anomalously negatively related to earnings when firms report losses (Jan and Ou 1995; Collins et al. 1999).

---

[15] Burgstahler and Dichev (1997) make similar predictions using an adaptation option argument.

TABLE 2

Relative Explanatory Power of Earnings and Cash Flows for Contemporaneous Stock Price and Future Earnings/Cash Flows[a]

	Undeflated			Per-Share			Deflated by Total Assets		
	Explanatory Power			Explanatory Power			Explanatory Power		
Dependent Variable[b]	OCF_t	$EARN_t$	Vuong Statistic	OCF_t	$EARN_t$	Vuong Statistic	OCF_t	$EARN_t$	Vuong Statistic
Panel A: Market Value of Equity									
All Firm-Years	64.30%	69.69%	6.10*	33.78%	39.89%	12.36*	3.14%	1.34%	11.85*
	(7.56)[c]	(15.53)	[11][d]	(4.15)	(7.71)	[10]	(−2.06)	(−1.25)	[9]
Firm years with positive *EARN* and *OCF*	63.81%	72.22%	9.37*	31.23%	47.40%	27.73*	8.54%	31.85%	34.06*
	(7.51)	(15.88)	[12]	(4.19)	(10.47)	[13]	(6.09)	(15.80)	[13]
Panel B: Future Operating Cash Flows									
All Firm-Years—One-Year-Ahead *OCF*	84.22%	67.32%	15.11*	55.42%	31.89%	26.75*	39.55%	28.97%	18.09*
	(1.00)	(1.76)	[13]	(0.86)	(1.12)	[13]	(0.77)	(0.61)	[13]
All Firm-Years—Two-Years-Ahead *OCF*	79.15%	63.09%	13.88*	46.21%	28.06%	21.67*	25.68%	19.23%	11.31*
	(1.05)	(1.84)	[13]	(0.90)	(1.20)	[13]	(0.79)	(0.63)	[12]
All Firm-Years—Three-Years-Ahead *OCF*	75.17%	60.85%	13.56*	39.48%	22.97%	21.04*	17.58%	13.09%	8.52*
	(1.11)	(1.97)	[13]	(0.96)	(1.25)	[13]	(0.89)	(0.71)	[11]
All Firm-Years—Discounted *OCF*	83.51%	68.90%	15.68*	55.18%	35.92%	27.77*	27.00%	19.12%	17.64*
	(9.18)	(16.18)	[13]	(7.39)	(10.24)	[13]	(4.85)	(3.81)	[13]

(continued on next page)

TABLE 2 (continued)

Dependent Variable[b]	Undeflated			Per-Share			Deflated by Total Assets		
	Explanatory Power		Vuong Statistic	Explanatory Power		Vuong Statistic	Explanatory Power		Vuong Statistic
	OCF_t	$EARN_t$		OCF_t	$EARN_t$		OCF_t	$EARN_t$	
Panel C: Future Earnings									
All Firm-Years—One-Year-Ahead *EARN*	51.26%	60.72%	7.55*	24.41%	39.15%	21.58*	31.27%	37.77%	9.44*
	(0.42)	(0.90)	[9]	(0.38)	(0.83)	[13]	(0.76)	(0.77)	[10]
All Firm-Years—Two-Years-Ahead *EARN*	37.65%	42.93%	4.14*	16.17%	23.05%	12.73*	16.57%	18.37%	3.89*
	(0.41)	(0.86)	[8]	(0.38)	(0.78)	[11]	(0.79)	(0.75)	[5]
All Firm-Years—Three-Years-Ahead *EARN*	31.80%	35.14%	3.38*	23.31%	24.82%	2.43**	8.24%	9.10%	2.36**
	(0.42)	(0.86)	[6]	(0.40)	(0.70)	[7]	(0.88)	(0.85)	[5]
All Firm-Years—Discounted *EARN*	60.87%	64.54%	3.63*	26.17%	30.74%	8.44*	18.72%	19.60%	2.01**
	(3.90)	(7.80)	[5]	(3.25)	(6.05)	[10]	(4.12)	(3.93)	[4]

---

*, ** Statistical significance at the 0.01 and 0.05 levels, respectively.

[a] Sample comprises all firm-years in the 2004 Compustat database with available data: 45395, 44943, and 45020 firm-years for the undeflated, per-share, and total-assets-deflated specifications, respectively.

[b] *OCF* represents operating cash flows (Compustat data item 308 – Compustat data item 124); *EARN* represents income before extraordinary items (Compustat data item 123); and *MKTV* represents market value of equity (Compustat data item 199 * Compustat data item 25). The deflators, shares outstanding and total assets, are Compustat data items 25 and 6, respectively. Discounted *OCF* (*EARN*) are computed as the discounted *OCF* (*EARN*) for each of the future three years and terminal values derived by assuming the realized four-years-ahead *OCF* (*EARN*) as a perpetuity. The discount rate used is the two-digit SIC industry cost of capital.

[c] Coefficient estimates are presented in parenthesis. All coefficients are significant at the 0.01 level (two-tailed).

[d] Numbers in brackets represent the number of years the Vuong (1989) statistic is significant at the 10 percent level when 13 annual regressions are estimated.

Because the relation between stock prices and earnings/cash flows depends on whether earnings/cash flows are positive or negative, pooling negative and positive earnings/cash flows will bias the coefficients on earnings/cash flows downward. Stated differently, our full sample results reported in Panel A, Table 2 are biased because we force the coefficients on negative and positive realizations of OCF and EARN to be the same. This bias depends on (1) the frequency of negative earnings/cash flows observations relative to positive earnings/cash flows observations and (2) the variance of negative observations relative to positive observations (see the Appendix for proof). This misspecification is more severe for the total-assets-deflated specification because the relative variance of negative earnings (cash flows) is proportionally higher for the total-assets-deflated specification than either the undeflated or per-share specifications.

One way to address this problem is to allow positive and negative quadrants of earnings/cash flows to have different coefficients. While this approach takes into account the differential slopes for negative and positive values of *EARN* and *OCF*, it is still not correctly specified because the coefficients in the negative quadrant are anomalously negative. Therefore, as an alternative, we restrict our sample to observations with positive earnings (or operating cash flows). While this ensures that the models are properly specified, it limits the generality of inferences.[16]

Results from regressions of market value on only positive realizations of *OCF* and *EARN* are reported in Panel A of Table 2. For completeness, we present results both for deflated and undeflated specifications. At the outset, we note that the coefficients on both *EARN* and *OCF* are positive in all three (i.e., undeflated, per-share, and total-assets-deflated) specifications, which suggests that all models are properly specified. We next examine patterns in explanatory power. There is little improvement in the explanatory power of *EARN* and *OCF* in the undeflated specification—the R^2s for *EARN* and *OCF* are 72.2 percent and 63.8 percent, respectively, and the difference is significant at the 1 percent level. However, the R^2s improve considerably for the per-share and total-assets-deflated specifications. More important, the improvement in explanatory power is more pronounced when the explanatory variable is *EARN*. Specifically, the R^2s for *EARN* are 47.4 percent (31.9 percent) and *OCF* are 31.2 percent (8.5 percent) for the per-share (total-assets-deflated) model and the differences in explanatory power between *EARN* and *OCF* are statistically significant at the 1 percent level across both deflators. In by-year analysis, *EARN* significantly outperforms *OCF* (at the 10 percent level of significance) in all of the 13 years examined for the per-share and the total-assets-deflated models. Overall, our results relating to contemporaneous market value are broadly consistent with prior research that documents the superiority of earnings over operating cash flows in explaining contemporaneous stock returns (e.g., Dechow 1994).[17]

Explanatory Power for Future Operating Cash Flows and Earnings

We next investigate the relative predictive ability of earnings and operating cash flows for both future operating cash flows and future earnings. We use future operating cash flows and earnings as alternative predictive criteria because both variables have been used in the literature to evaluate value relevance, although neither variable is a value attribute. For example, Barth et al. (2001) and Burgstahler et al. (1999), among others, use future operating cash flows as the predictive criterion. Alternatively, Ou and Penman (1989), Sloan (1996), Aboody et al. (1999), and Dhaliwal et al. (1999), among others, use future earnings as the predictive criterion.

---

[16] As a sensitivity check, we conduct analyses wherein we allow separate coefficients for positive and negative earnings and cash flows and the tenor of our conclusions are similar to that obtained when we restrict our sample to firms with positive earnings and cash flow realizations.

[17] Our analysis considers a "levels" framework with market value, rather a "changes" framework with returns. However, Kothari and Zimmerman (1995) show that price-based and return-based frameworks are equivalent. As a sensitivity analysis, we also deflate our models by P_{t-1}, which is similar to a returns' framework and find qualitatively similar results.

Results from examining the predictive ability of the two summary measures for future operating cash flows and future earnings are presented in Panels B and C of Table 2, respectively. As with prior work we consider one-, two-, and three-periods-ahead earnings and operating cash flows as the dependent variables. Finally, as in Barth et al. (2001), we also examine measures of pseudo intrinsic values generated by extrapolating the three years of future operating cash flows (or earnings).[18] Once again, we report results from both undeflated and deflated (per-share and total assets) specifications.

From Panel B of Table 2 it is evident that operating cash flows better predict future operating cash flows than current earnings, consistent with prior research. This result obtains across one-, two-, and three-periods-ahead operating cash flows. However, when the prediction criterion is future earnings rather than future operating cash flows, the results are reversed. Specifically, for all horizons and specifications the explanatory power of *EARN* is significantly greater than that of *OCF* at the 5 percent level (see Panel C of Table 2). Unlike the market-value specification, the anomalous negative coefficient does not arise when we use future operating cash flows/earnings as the dependent variable. This is probably because, unlike market values that are truncated at zero, future earnings or cash flows can have negative realizations.

In summary, the preliminary results regarding the relative value relevance of earnings and operating cash flows do not provide unambiguous answers. Most important, the results reverse when the prediction criterion is switched from future operating cash flows to future earnings, i.e., while current cash flows better predict future cash flows, current earnings better predict future earnings. These contrasting results arise because of the correlation structure between current accruals and future cash flows and between current accruals and future earnings.[19]

V. *EX POST* INTRINSIC VALUE ANALYSIS

We next present results of our primary analyses using *ex post* intrinsic values as the predictive criterion. Panel A of Table 3 reports the relative explanatory powers of operating

---

[18] Similar to Barth et al. (2001), we calculate pseudo intrinsic values by discounting three years of future cash flows (or earnings as the case may be) and terminal values, which is extrapolated from the cash flow (or earnings) time-series. We refer to these as pseudo intrinsic values because theoretically discounting operating cash flows (or earnings) does not produce intrinsic values.

[19] Specifically, earnings will better predict future earnings than operating cash flows when accruals (that are added to cash flows to obtain earnings) are positively correlated with future earnings. Similarly, cash flows will better predict future cash flows than earnings when current accruals are negatively correlated with future cash flows. Unreported results reveal that current accruals are positively (negatively) correlated with future earnings (future operating cash flows). While the positive correlation between accruals and future earnings is intuitive, the negative correlation between accruals and future cash flows is counterintuitive and requires elaboration. First, it is important to note that accruals are positively related to future cash flows after controlling for current cash flows (e.g., Sloan 1996). This result is consistent with the intuition that accruals incrementally reflect future cash flow effects in a timely manner. How does one then explain the unconditional negative correlation between accruals and future cash flows? This happens because of two important correlations. First, current cash flows are strongly positively correlated with future cash flows. Second, as reported in past research (e.g., Subramanyam 1996; Dechow et al. 1998), accruals are strongly negatively correlated with current operating cash flows. This negative correlation arises because accruals smooth transitory fluctuations in cash flows. The combined effect is that accruals are unconditionally negatively correlated with future cash flows (even though they are positively correlated after controlling for current cash flows).

TABLE 3

Relative Explanatory Power of Earnings and Cash Flows for Alternative Measures of *Ex Post* Intrinsic Value[a]

	Undeflated			Per-Share			Deflated by Total Assets		
	Explanatory Power		Vuong Statistic	Explanatory Power		Vuong Statistic	Explanatory Power		Vuong Statistic
Dependent Variable[b]	OCF_t	$EARN_t$		OCF_t	$EARN_t$		OCF_t	$EARN_t$	
Panel A: All Firms Years									
IV	58.12% (7.50)[c]	62.18% (15.31)	4.87* [9][d]	26.30% (4.69)	27.73% (8.24)	3.32* [8]	0.22% (−0.63)	0.11% (−0.42)	2.66* [2]
Panel B: Only Firm Years with Positive *EARN* and *OCF*									
IV	57.90% (7.44)	64.56% (15.61)	7.90* [12]	22.97% (4.70)	31.07% (11.09)	16.22* [13]	7.87% (7.09)	18.76% (15.32)	22.55* [13]

---

*, ** Statistical significance at the 0.01 and 0.05 levels, respectively.

[a] Sample comprises all firm-years in the 2004 Compustat database with available data: 45395, 44943, and 45020 firm-years for the undeflated, per-share, and total-assets-deflated specifications, respectively.

[b] *OCF* represents operating cash flows (Compustat data item 308 – Compustat data item 124); *EARN* represents income before extraordinary items (Compustat data item 123); and *IV* represents intrinsic value using the dividend discount model for a three-year horizon with market value of equity at the end of the third year as terminal value. The discount rate used is the two-digit SIC industry cost of capital. The deflators, shares outstanding and total assets, are Compustat data items 25 and 6, respectively.

[c] Coefficient estimates are presented in parenthesis. All coefficients are significant at the 0.01 level (two-tailed).

[d] Numbers in brackets represent the number of years the Vuong (1989) statistic is significant at the 0.10 level when 13 annual regressions are estimated.

cash flows (*OCF*) and earnings (*EARN*) for the *ex post* intrinsic value measure (*IV*). We once again present results for undeflated, per-share, and total-assets-deflated specifications. In the undeflated and per-share regressions, the R^2s for *EARN* are significantly higher than those for *OCF*—R^2s for *EARN* (*OCF*) are 62.2 percent (58.1 percent) for the undeflated specifications and 27.7 percent (26.3 percent) for the per-share specifications, and both differences are significant at the 1 percent level. By-year analysis indicates that *EARN* is superior to *OCF* in explaining *IV* for 9 (8) out of 13 years for the undeflated (per-share) specification. The results from the total-assets-deflated specification are mixed, with extremely low explanatory power (less than 1 percent). However, as indicated earlier, these results are non-interpretable because coefficients on the *EARN* and *OCF* are negative. Accordingly, we repeat our analysis after deleting all observations with negative *EARN* and *OCF*.

In Panel B of Table 3, we report explanatory power of regressions with *OCF* and *EARN* respectively as the explanatory variables for a subsample containing observations with only positive values for both *OCF* and *EARN*. The undeflated results are similar to that in Panel A—the explanatory power of *EARN* is significantly higher than that of *OCF*. While the per-share results are directionally and statistically similar to that in Panel A, the magnitude by which *EARN* dominates *OCF* is much larger (*OCF* = 23.0 percent and *EARN* = 31.1 percent). Finally, unlike Panel A, *EARN* generates significantly higher R^2s than *OCF* (*OCF* = 7.9 percent and *EARN* = 18.8 percent) even for the total-assets-deflated specification. Also, in all of the 13 years examined, *EARN*'s explanatory power is higher than *OCF*'s across both undeflated and deflated specifications.

We also examine whether there is significant variation in our results based on industry membership. For this purpose, we replicate our analysis by major industry classes based on the industry classification adopted in Barth et al. (2001). Unreported results reveal no systematic pattern in the relative importance of earnings and cash flows across industries. *OCF* does not generate statistically higher R^2s for any of the industries examined. *EARN* generates statistically higher R^2s for all industries with the exception of agriculture, extractive industries, pharmaceuticals, and utilities. We conjecture that *EARN* is not able to dominate *OCF* in these industries for the following reasons: (1) agriculture and extractive industries are characterized by extremely long-lived assets, which could reduce earnings' value relevance because depreciation is not economically relevant; (2) the regulatory nature of utilities could cause earnings to be less informative; and (3) high R&D intensity in the pharmaceutical industry makes earnings similar to cash flows because of R&D write-offs.

Overall, our results are consistent with the relative superior ability of earnings vis-à-vis operating cash flows in explaining *ex post* intrinsic value. Given the consistent results obtained across various specifications we believe that our results provide unambiguous evidence on the relative superiority of accrual-based earnings as a summary measure that reflects expected future cash flows to investors.

VI. ADDITIONAL ANALYSES

We have argued that the *ex post* intrinsic value approach abstracts from inference problems arising from market mispricing related to accruals when stock price (returns) is used as the predictive criterion. However, the use of future stock prices to calculate terminal value results in high correlation between our *ex post* intrinsic value measures and current stock prices. This raises two concerns: (1) empirically, are our results using intrinsic values distinct from those using stock price (or returns); and (2) does our approach adequately control for accruals' mispricing? We address these concerns by conducting additional tests described below.

Mechanical Correlation between Intrinsic Values and Market Values

Theoretically, the intrinsic value measure captures a construct that is sufficiently different from stock price. However, this does not imply that intrinsic values *empirically* capture a construct that is different from stock price. Indeed, intrinsic value measures are highly correlated with market values in their undeflated and per-share form, although the correlation is lower after total-assets deflation (see Panel B of Table 1). Therefore, it is reasonable to question whether our results provide any additional insights beyond that provided by stock returns' research.

To demonstrate that we are documenting an economic phenomenon that is distinct from that documented by prior studies, we show that our results obtain even when we consider firms where the intrinsic values and stock prices are sufficiently different. In particular, we partition our sample into two subsamples (*HIGH* and *LOW*) representing the top third and bottom third of the distribution of the absolute value of valuation errors—defined as the absolute value of the difference between current market value and *ex post* intrinsic value scaled by current market value (Francis et al. 2000). We then document that the superiority of *EARN* over *OCF* is present even in the subsample with high valuation errors.

Panel A of Table 4 reports descriptive statistics on the valuation errors. The mean valuation error ranges from 63 percent to 69 percent, while the median valuation error is between 45 percent and 47 percent. These statistics are comparable to those reported by Francis et al. (2000).[20] In unreported results, we find that the signed valuation error is on average negative, consistent with Penman and Sougiannis (1998), indicating that our intrinsic value measures are generally larger than price because of the large *ex post* returns during the bull market years covered by our sample.

Table 4, Panel B reports correlation between market values and intrinsic values for the third of our sample with the highest absolute errors (*HIGH*) and that with the lowest absolute valuation errors (*LOW*). The correlation between market values and intrinsic values are generally lower for the *HIGH* group than the *LOW* group. For the undeflated specification, the correlation between *MKTV* and *IV* for the *HIGH* group is 0.62, which is significantly lower than that for the *LOW* group of 0.98. For deflated measures, the correlations are dramatically different between *HIGH* and *LOW* groups. Specifically, the correlation is 0.97 (0.97) for the *LOW* group compared to 0.49 (0.24) for the *HIGH* group using per-share (total-assets-deflated) variable. This evidence does suggest that *ex post* intrinsic values are sufficiently different from market values in the *HIGH* valuation error group.

We next present results of regression of intrinsic value measures on *EARN* and *OCF* for the subsample of firms in the *HIGH* valuation error group (Table 4, Panel C). For brevity, we discuss results relating to specifications that only consider firm observations with positive cash flows and earnings. We find that earnings dominate cash flows in all specifications (the differences in R^2s are significant unanimously at the 1 percent level and for a majority of the years examined). These results suggest that our full sample results are not attributable to the high correlation between market values and intrinsic values. Rather, these results imply that earnings are superior to cash flows in predicting *ex post* intrinsic values, which are a distinctly different economic construct from market values.

---

[20] The large valuation errors may raise concern regarding the high measurement error in the *IV* estimates. However, because intrinsic values are measured *ex post*, the valuation errors do not really measure the extent of estimation error in *IV*. Rather, they are monotonically related to the magnitude of (absolute) future returns. In unreported analysis we find that the average absolute three-year future returns for our sample is 55 percent, which is comparable to the extent of absolute valuation errors.

TABLE 4
Relative Explanatory Power of Earnings and Cash Flows for Alternative Measures of *Ex Post* Intrinsic Value Conditional on the Magnitude of Valuation Errors[a]

Panel A: Distribution of Valuation Errors

Variable[b]	**Deflator**	**Mean**	**Median**	**Std. Dev.**	**Skewness**
ERROR	Undeflated ($ m)	0.67	0.47	0.89	3.77
	Per-Share	0.69	0.46	1.18	10.15
	Total Assets	0.63	0.45	0.77	3.48

Panel B: Pearson Correlation between Intrinsic Value and Market Value

	Undeflated	**Per-Share**	**Deflated by Total Assets**
All Firm Years	0.87	0.70	0.52
LOW ERROR	0.98	0.97	0.97
HIGH ERROR	0.62	0.49	0.24

(*continued on next page*)

TABLE 4 (continued)

Panel C: Regression of *IV* for the *HIGH ERROR* Group[c]

	Undeflated			Per-Share			Deflated by Total Assets		
	Explanatory Power		Vuong Statistic	Explanatory Power		Vuong Statistic	Explanatory Power		Vuong Statistic
Dependent Variable	OCF_t	$EARN_t$		OCF_t	$EARN_t$		OCF_t	$EARN_t$	
All Firms Years									
IV	36.28% (9.03)[d]	42.92% (19.00)	3.00* [10][e]	16.11% (5.92)	17.61% (9.33)	2.66* [8]	0.02% (0.25)	0.01% (0.16)	0.66 [4]
Only Firm Years with Positive *EARN* and *OCF*									
IV	37.01% (8.37)	47.31% (18.57)	4.91* [8]	16.08% (5.79)	22.80% (14.21)	7.69* [10]	5.80% (8.20)	13.45% (13.45)	10.20* [10]

---

*, ** Statistical significance at the 0.01 and 0.05 levels, respectively.

[a] Sample comprises all firm-years in the 2004 Compustat database with available data: 45395, 44943, and 45020 firm-years for the undeflated, per-share, and total-assets-deflated specifications, respectively.

[b] Valuation error (*ERROR*) is defined as the absolute value of the difference between current market value of equity (*MKTV*) and *ex post* intrinsic value measure (*IV*) scaled by current market value of equity (*MKTV*). *HIGH* (*LOW*) *ERROR* represents observations in the top (bottom) third of firm observations ranked on the basis of valuation error.

[c] *OCF* represents operating cash flows (Compustat data item 308 – Compustat data item 124); *EARN* represents income before extraordinary items (Compustat data item 123); and *IV* represents intrinsic value using the dividend discount model for a three-year horizon with market value of equity at the end of the third year as terminal value. The discount rate used is the two-digit SIC industry cost of capital. The deflators, shares outstanding and total assets, are Compustat data items 25 and 6, respectively.

[d] In Panel C, coefficient estimates are presented in parenthesis. All coefficients are significant at the 0.01 level (two-tailed).

[e] Numbers in brackets represent the number of years the Vuong (1898) statistic is significant at the 10 percent level when 13 yearly regressions for IV are estimated.

Accruals Mispricing and *Ex Post* Intrinsic Values

For our approach to overcome problems with the stock-price (returns) methodology, it is important that our intrinsic value measures are not affected by accruals mispricing. Recall that we use three-years-ahead market values as terminal values in our intrinsic value computation. We maintain that three-years-ahead market values used in computing intrinsic values are unlikely to be contaminated by mispricing of *current* accruals or cash flows.[21] This is because abnormal returns associated with the accruals mispricing do not appear to persist for more than two years after the earnings announcement (Sloan 1996). Nevertheless, we explore the extent to which our intrinsic-value-based results are affected (or unaffected) by mispricing of current accruals.

We conduct two tests to offer evidence in support of this argument. First, we estimate the time-series persistence of the accrual component of earnings. If current accruals are highly correlated with future accruals, then it is possible that future prices may indirectly reflect mispricing related to current accruals. In unreported results, we find the autoregression coefficient from regressing three-year-ahead accruals on current accruals is just 0.17. Thus, only 17 percent of accruals persist beyond three years, suggesting that the likelihood of this indirect link is small.

Next, a comparison of regression results in Table 2, Panel A and Table 3 reveals that the magnitude of the superior explanatory power of *EARN* over *OCF* is substantially larger when market value is the dependent variable than when *ex post* intrinsic value is the dependent variable (these results are particularly pronounced for the deflated specifications). This suggests that the results using stock prices do reflect some measure of accrual mispricing that is not present in those using intrinsic values.

To further explore the effect of accrual mispricing on the intrinsic-value-based tests (relative to that on the market-value-based tests), we perform the following analysis. We form ten portfolios based on accruals (deflated by total assets), as in Sloan (1996). We then separately group firms in the two extreme accrual deciles (*EXTREME* partition) and the two middle deciles (*MIDDLE* partition). Given Sloan's results, accruals' mispricing is expected to occur mainly in the *EXTREME* partition and, hence, market values should be more spuriously correlated with *EARN* in this partition. Accordingly, if intrinsic values are uncontaminated by accruals mispricing, the superiority of *EARN* over *OCF* in explaining market values should be more pronounced than superiority of *EARN* over *OCF* in explaining intrinsic values for firms in the *EXTREME* partition. As a corollary, since significant accruals mispricing is unlikely to occur in the *MIDDLE* partition, the relative superiority of *EARN* over *OCF* in explaining market values should be no different than that in explaining intrinsic values in the *MIDDLE* partition.

Table 5 reports R^2s for 2 × 2 regressions of *MKTV* and *IV* on *EARN* and *OCF* separately for the *EXTREME* and *MIDDLE* partitions under various alternative specifications (pooled and subsample of firms with positive *OCF* and *EARN*) and deflators (undeflated, per-share, and total assets). The results in Table 5 are consistent with *ex post* intrinsic value measure being influenced less by the effects of accruals' mispricing. For the *EXTREME* partition, where the accruals' mispricing is more likely, there are striking differences in the relative superiority of *EARN* over *OCF* in explaining *MKTV* versus in explaining *IV*. For example, in the pooled regressions, the explanatory power of *EARN* is higher than that of *OCF* by 13.88 percent (18.32 percent) for the undeflated (per-share) specifications when *MKTV* is the dependent variable, but only 0.61 percent (4.95 percent) when *IV* is the dependent

---

[21] We do not claim that future stock prices used in determining terminal values are correctly priced. It is likely that future stock prices misprice the cash flow and accrual components of earnings at that point in time.

TABLE 5

Differences in Explanatory Power of Cash Flows and Earnings for Market Value and *Ex Post* Intrinsic Value Measures for Partitions Based on Extreme and Middle Accrual Portfolios[a,b,c]

	Pooled				Only Firm-Years with Positive EARN and OCF			
	MIDDLE		*EXTREME*		*MIDDLE*		*EXTREME*	
	MKTV	*IV*	*MKTV*	*IV*	*MKTV*	*IV*	*MKTV*	*IV*
Undeflated								
EARN	74.44%	66.01%	43.24%	26.78%	77.13%	67.88%	59.54%	39.71%
OCF	72.82%	62.58%	29.36%	26.17%	73.04%	62.48%	29.45%	28.73%
Difference	1.62%	3.43%	13.88%	0.61%	4.09%	5.40%	30.09%	10.98%
Per-Share								
EARN	35.70%	26.08%	26.18%	13.71%	44.71%	28.10%	43.24%	23.61%
OCF	41.18%	28.92%	7.86%	8.76%	39.80%	24.84%	13.43%	12.43%
Difference	−5.48%	−2.84%	18.32%	4.95%	4.91%	3.26%	29.81%	11.18%
Deflated by Total Assets								
EARN	1.78%	0.02%	4.82%	0.42%	33.46%	26.06%	16.72%	6.57%
OCF	1.73%	0.02%	5.50%	0.92%	24.12%	17.20%	0.54%	0.00%
Difference	0.05%	0.00%	−0.68%	−0.50%	9.34%	8.86%	16.18%	6.57%

---

[a] Sample comprises all firm-years in the 2004 Compustat database with available data: 45395, 44943, and 45020 firm-years for the undeflated, per-share, and total-assets-deflated specifications, respectively.

[b] Table compares explanatory power of regressions where *MKTV* or *IV* are regressed on *OCF* or *EARN*, separately for *EXTREME* and *MIDDLE* accrual partition. *EXTREME* accrual partition represents firm-years where accruals (deflated by total assets) are in the highest or lowest deciles of the distribution of accruals for that year, while firm-year observations in the middle two deciles are included in the *MIDDLE* partition. Accruals are defined as *EARN* minus *OCF*. The number of observations for the *EXTREME* (*MIDDLE*) partitions for the pooled sample are 9071 (9082), 8977 (8990), and 8994 (9006) firm-years for the undeflated, per-share, and total-assets-deflated specifications, respectively. The number of observations for the *EXTREME* (*MIDDLE*) partitions for the subsample with only positive earnings and cash flows are 2500 (7434), 3340 (7102), and 2570 (7690) firm-years for the undeflated, per-share, and total-assets-deflated specifications, respectively.

[c] *OCF* represents operating cash flows (Compustat data item 308 – Compustat data item 124); *EARN* represents income before extraordinary items (Compustat data item 123); *MKTV* represents market value of equity (Compustat data item 199 * Compustat data item 25); and *IV* represents intrinsic value using the dividend discount model for a three-year horizon with market value of equity at the end of the third year as terminal value. The discount rate used is the two-digit SIC industry cost of capital. The deflators, shares outstanding and total assets, are Compustat data items 25 and 6, respectively.

variable (note that total-assets-deflated regressions are not interpretable for the pooled analysis). Similar results obtain for regressions that considers only firm-years with positive *EARN* and *OCF*. For the *MIDDLE* partition, where there is less likelihood of mispricing, we do not find consistent evidence that *EARN*'s superior explanatory power vis-à-vis *OCF* is more pronounced for *MKTV* than for *IV* regressions. These results suggest that a significant portion of the superior explanatory power of *EARN* vis-à-vis *OCF* in the *MKTV* regressions is attributable to the stock market's mispricing of accruals, but that this bias is substantially ameliorated when *IV* is used as the dependent variable.

We acknowledge that the above analysis does not completely rule out market's mispricing of accruals as a possible explanation for our findings, but it does demonstrate the benefits from using the *ex post* intrinsic value approach relative to the stock returns approach.

VII. CONCLUSION

The objective of our study is to examine the relative importance of earnings and operating cash flows in equity valuation. We document that earnings are superior to cash flows in explaining *ex post* intrinsic values. This evidence supports the FASB's assertion that accrual based earnings is superior to cash flows in providing information about users' future cash flows (SFAC No. 1, FASB 1978, para. 44).

The salient feature of our study is the use of *ex post* intrinsic value of equity to examine this question. We believe that the *ex post* intrinsic value approach that we adopt contributes to this debate by providing unambiguous evidence about the superiority of earnings over operating cash flows as a summary indicator of fundamental equity value. Unlike stock returns, intrinsic values are not contaminated by the stock market's fixation on reported earnings and the consequent mispricing of the accruals' and cash flow components of earnings (Sloan 1996). Also, the intrinsic value measure that we use captures the present value of all future cash receipts to the investors and, hence, provides a more formal and comprehensive measure of fundamental equity value than a finite horizon of future operating cash flows used in prior research. In this sense, the intrinsic value approach is a more direct test of the FASB's assertion that accrual earnings are superior to cash flows in predicting users' future cash flows.

Our study is subject to the following caveats. First, *ex post* intrinsic value measures are not completely independent of stock prices, because we use future (three-years-ahead) stock prices when determining terminal values. Therefore, our approach could be criticized for being contaminated by the accrual anomaly. While we acknowledge this criticism, we note that the anomalous mispricing of accruals does not persist beyond two years (Sloan 1996). Hence, the possibility of three-years-ahead prices being contaminated by mispricing of current accruals is unlikely. Also, additional analyses suggest our intrinsic-value method does substantially mitigate the effects of accruals' mispricing. Second, the superiority of intrinsic value as the predictive criterion applies only when one takes a valuation perspective from the equity investors' standpoint. It is possible that the information needs of other users, e.g., creditors and debtholders, differ from those of equity investors. Hence, our results may not necessarily generalize to a broad class of users of accounting information.

APPENDIX

In this Appendix, we discuss why we get anomalous negative coefficients when we regress market value (or intrinsic value) on earnings (or cash flows) after we deflate our variables by a scale proxy, such as shares outstanding, book value, or total assets.

Recall that past research has shown that while positive earnings are reliably positively associated with market values, the relationship between price and negative earnings (losses) is anomalously negative (e.g., Jan and Ou 1995; Collins et al. 1999). This anomalous negative association between market values and negative earnings will bias the coefficient in a pooled regression of market values on earnings that has both negative and positive values of earnings, i.e., the "pooled" coefficient. Below, we rigorously demonstrate that the extent of this bias will depend on the weight that the negative observations have on influencing the pooled coefficient.

Let us consider the equation of the form:

$$Y = \mathrm{a}_0 + \mathrm{a}_1 X + \varepsilon \tag{i}$$

where Y is market value of equity and X is earnings (or cash flows). Estimating Equation (i) assumes identical coefficients for both positive and negative realization of X. However, prior research suggests that the coefficient for negative realizations of X is negative, while it is positive for positive realizations of X. To examine the implications of restricting the same coefficient on both positive and negative realizations of X, we can rewrite Equation (i) as a structural (stacked) equation of the form:

$$(Y_1 Y_2)' = (X_1 X_2)\,(\mathrm{b}_1 \mathrm{b}_2)' + (\varepsilon_1 \varepsilon_2)' \tag{ii}$$

where X_1 represents positive observations of X and X_2 represents negative observations of X. For simplicity, let us assume that this Equation (ii) is estimated in "deviation from means" form (to avoid intercept effects). Then, $\mathrm{b}_1 = (X_1'X_1)^{-1}\, X_1'Y_1$ and $\mathrm{b}_2 = (\mathrm{X}_2'\mathrm{X}_2)^{-1}\, \mathrm{X}_2'\mathrm{Y}_2$ (see, Johnston 1984, 209–210). However, in fitting the restricted model where $\mathrm{b}_1 = \mathrm{b}_2 = \mathrm{a}_1$, the coefficient, a_1, is $(X_1'X_1 + X_2'X_2)^{-1}\, (X_1'Y_1 + X_2'Y_2)$. Note that, in difference form, $X'X$s are scalars and denote variances. Through algebraic manipulation we can represent a_1 as a linear combination of b_1 and b_2:

$$\mathrm{a}_1 = \mathrm{b}_1 * (X_1'X_1)/(X_1'X_1 + X_2'X_2) + \mathrm{b}_2 * (X_2'X_2)/(X_1'X_1 + X_2'X_2),$$

that is:

$$\mathrm{a}_1 = \mathrm{b}_1 * (\sigma^2_{X_1})/\sigma^2_{X_1} + \sigma^2_{X_2}) + \mathrm{b}_2 * (\sigma^2_{X_1})/(\sigma^2_{X_1} + \sigma^2_{X_2}).$$

Thus, the pooled coefficient will be a weighted average of the coefficients on negative and positive quadrants where the weighting is proportional to their respective variances.

The above discussion demonstrates that the extent to which the negative observations will bias the pooled coefficient depends on the relative variance of the negative observations vis-à-vis the positive observations of earnings. In our sample, the variance for undeflated positive earnings is 21138, while that for negative earnings is 353. Thus, the ratio of variance of negative observations relative to total variance is 1.6 percent. This implies that the weight on negative observations is relatively small. However, for variables deflated by shares outstanding (total assets), the variance of positive earnings observations is 1.03 (0.002), while that for negative observations is 0.48 (0.035). This suggests that the weight on negative earnings observations is 32 percent (95 percent), which is very high relative to the ratios from the undeflated models. Similar variance ratios are obtained for operating cash flows. This explains why the bias arising from the presence of negative observations is more pronounced for deflated models.

REFERENCES

Aboody, D., M. E. Barth, and R. Kasznik. 1999. Revaluations of fixed assets and future firm performance. *Journal of Accounting and Economics* 26: 149–178.

———, J. Hughes, and J. Liu. 2002. Measuring value relevance in a (possibly) inefficient market. *Journal of Accounting Research* 40: 965–986.

Ali, A. 1994. The incremental information content of earnings, working capital from operations, and cash flows. *Journal of Accounting Research* 32: 61–74.

Barth, M. E., D. Cram, and K. Nelson. 2001. Accruals and the prediction of future cash flows. *The Accounting Review* 76: 27–58.

Bowen, R. M., D. Burgstahler, and L. A. Daley. 1986. Evidence on the relationships between earnings and various measures of cash flow. *The Accounting Review* 61: 713–726.

———, ———, and ———. 1987. The incremental information content of accruals versus cash flows. *The Accounting Review* 62: 723–747.

Bradshaw, M. T., S. A. Richardson, and R. G. Sloan. 2001. Do analysts and auditors use information in accruals? *Journal of Accounting Research* 39: 45–74.

Brown, S., K. Lo, and T. Lys. 1999. Use of R^2 in accounting research: Measuring changes in value relevance over the last four decades. *Journal of Accounting and Economics* 28: 83–115.

Burgstahler, D., and I. Dichev, 1997. Earnings, adaptation, and equity value. *The Accounting Review* 72: 187–215.

———, J. Jiambalvo, and Y. Pyo. 1999. The informativeness of cash flows for future cash flows. Working paper, University of Washington.

Collins, D. W., M. Pincus, and H. Xie. 1999. Equity valuation and negative earnings: The role of book value of equity. *The Accounting Review* 74: 29–61.

Copeland, T., T. Koller, and J. Murrin. 2000. *Valuation: Measuring and Managing the Value of Companies*. 3rd edition. New York, NY: John Wiley & Sons.

Dechow, P. M. 1994. Accounting earnings and cash flows as measures of firm performance: The role of accounting accruals. *Journal of Accounting and Economics* 18: 3–42.

———, S. P. Kothari, and R. Watts. 1998. The relation between earnings and cash flows. *Journal of Accounting and Economics* 25: 133–168.

Desai, H., S. Rajgopal, and M. Venkatachalam. 2004. Value-glamour and accruals mispricing: One anomaly or two. *The Accounting Review* 79: 355–385.

Dhaliwal, D., K. R. Subramanyam, and R. Trezevant. 1999. Is comprehensive income superior to net income as a measure of firm performance? *Journal of Accounting and Economics* 26: 43–67.

Easton, P. D. 1998. Discussion of revalued financial, tangible, and intangible assets: Association with share prices and non-market-based value estimates. *Journal of Accounting Research* 36 (Supplement): 235–247.

———, and G. Sommers. 2003. Scale and the scale effect in market-based accounting research. *Journal of Business, Finance and Accounting* 30: 25–56.

Financial Accounting Standards Board (FASB). 1978. *Objectives of Financial Reporting by Business Enterprises*. Statement of Financial Accounting Concepts No. 1. Stamford, CT: FASB.

Francis, J., P. Olsson, and D. R. Oswald. 2000. Comparing the accuracy and explainability of dividend, free cash flow, and abnormal earnings equity value estimates. *Journal of Accounting Research* Spring: 45–70.

Greenberg, R. R., G. L. Johnson, and K. Ramesh. 1986. Earnings versus cash flow as a predictor of future cash flow measures. *Journal of Accounting, Auditing & Finance*: 266–277.

Hayn, C. 1995. The information content of losses. *Journal of Accounting and Economics* 20: 125–153.

Holthausen, R. W., and R. L. Watts, 2001. The relevance of the value-relevance literature for financial accounting standard setting. *Journal of Accounting and Economics* 31: 3–75.

Hribar, P., and D. Collins. 2002. Errors in estimating accruals: Implications for empirical research. *Journal of Accounting Research* 40: 105–134.

Jan, C. L., and J. Ou. 1995. The role of negative earnings in the valuation of equity stocks. Working paper, New York University and Santa Clara University.

Johnston, J. 1984. *Econometric Methods.* Third edition. New York, NY: McGraw-Hill, Inc.

Kim, M., and W. Kross, 2005. The ability of earnings to predict future operating cash flows has been increasing—not decreasing. *Journal of Accounting Research* 43: 753–780.

Kothari, S. P., and J. L. Zimmerman. 1995. Price and return models. *Journal of Accounting and Economics* 20: 155–192.

Ohlson, J. A. 1989. Ungarbled earnings and dividends: An analysis and extension of the Beaver, Lambert, and Morse valuation model. *Journal of Accounting and Economics* 11: 109–115.

Ou, J. A., and S. H. Penman. 1989. Financial statement analysis and the prediction of stock returns. *Journal of Accounting and Economics* 11: 295–329.

Palepu, K., P. Healy, and V. Bernard. 2000. *Business Analysis and Valuation: Using Financial Statements, Text and Cases.* Second edition. Cincinnati, OH: South-Western.

Penman, S., and T. Sougiannis. 1998. A comparison of dividend, cash flow, and earnings approaches to equity valuation. *Contemporary Accounting Research*: 343–383.

Preinreich, G. 1938. Annual survey of economic theory: The theory of depreciation. *Econometrica* 6: 219–241.

Rayburn, J. 1986. The association of operating cash flow and accruals with security returns. *Journal of Accounting Research* 24: 112–133.

Schipper, K. 1989. Commentary on earnings management. *Accounting Horizons* 3: 91–102.

Thomas, J. K., and H. Zhang. 2002. Inventory changes and future returns. *Review of Accounting Studies* 7: 163–184.

Sloan, R. 1996. Do stock prices fully reflect information in accruals and cash flows about future earnings? *The Accounting Review* 71: 305–333.

Subramanyam, K. R. 1996. The pricing of discretionary accruals. *Journal of Accounting and Economics* 22: 249–281.

Vuong, Q. H. 1989. Likelihood ratio tests for model selection and non-nested hypotheses. *Econometrica* 57: 307–333.

Xie, H. 2001. The mispricing of abnormal accruals. *The Accounting Review* 76: 357–373.

THE ACCOUNTING REVIEW
Vol. 82, No. 2
2007
pp. 483–520

Value Creation in Public Enterprises: An Empirical Analysis of Coordinated Organizational Changes in the Veterans Health Administration

Nicole Thibodeau
Naval Postgraduate School

John H. (Harry) Evans III
University of Pittsburgh

Nandu J. Nagarajan
University of Pittsburgh

Jeff Whittle
VA Medical Center, Milwaukee
Medical College of Wisconsin, Milwaukee

ABSTRACT: As part of a federal government initiative to increase efficiency and quality, in 1996 the United States Veterans Health Administration (VHA) radically restructured its organizational design and management processes. This study uses 1992–1998 clinical, workload, and financial data to examine the effect of this reform on performance. Several previous government attempts to introduce private sector management practices, such as management by objectives (MBO) or program planning and budgeting system (PPBS), have been largely unsuccessful. In contrast to prior reforms, the current restructuring introduced coordinated changes in the VHA organizational structure, performance measurement, and reward systems. Our results document that, following the

---

We thank anonymous reviewers from *The Accounting Review*, the 2004 American Accounting Association Annual Meeting, the 2005 Government and Not-for-Profit Section conference, participants in those conferences as well as seminars at Baruch College–CUNY, Emory University, the Naval Postgraduate School, and Northern Illinois University, Michael Granoff, Jean-François Henri, Claude Laurin, Murray Lindsay, Ella Mae Matsumura, James Patton, Eoin W. Trevelyan, Sally Widener, and especially Ranjani Krishnan for their helpful comments and suggestions. Shuqing Luo provided excellent research assistance. We are grateful to the Veterans Health Administration for providing access to data and personnel, and we are thankful in particular to James F. Burgess Jr., Kathleen A. Carey, Kathleen L. Frisbee, Donald Going, David Greenblatt, Kenneth W. Kizer, Jane McMahon, David McPherson, and Jonathan B. Perlin.

The views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs.

Editor's note: This paper was accepted by Dan Dhaliwal.

Submitted June 2005
Accepted October 2006

reorganization, the VHA cost per patient declined significantly and various quality measures improved. Our analysis suggests that reduction in excess capacity and the more intense use of remaining capacity are among the primary explanations for the VHA achieving the observed cost reductions. These findings suggest that *coordinated* changes in organizational structure, performance measures, and incentives can create value for public enterprises even though control mechanisms are generally more limited in these environments than in the private sector.

I. INTRODUCTION

Recent financial economics research has documented that organizational restructuring in publicly traded companies generally fails to create value unless the restructuring includes the implementation of effective management control systems.[1] Publicly traded companies are subject to the discipline of the market, and ineffective internal reorganization will generally be viewed skeptically by the market. Governmental organizations, on the other hand, have the dual handicaps of bureaucracy, which impedes internal change, and the lack of a market mechanism to provide feedback on proposed changes. Although governments have introduced a number of organizational and control system reforms in recent years, both in the U.S. and worldwide (Cavalluzzo and Ittner 2004; Atkinson and McCrindell 1997; Hood 1995), much less is known about the effect of such management innovations in government than in the private sector (Ittner and Larcker 1998). As a consequence, we have limited understanding of what processes can produce value-creating internal restructuring in governmental organizations.

This study seeks to provide empirical evidence on the type of restructuring that can be value-creating in governmental organizations. To do so, we document how *coordinated* (as opposed to piecemeal) changes in the organizational structure and management control systems of a large government agency affected the efficiency and quality of services provided.

The Veterans Healthcare Administration (VHA) is the Veterans Affairs healthcare system, the second largest agency in the federal government and the United States' largest integrated healthcare system. In response to criticism regarding the efficiency and quality of healthcare services provided to military veterans, the VHA introduced a variety of uncoordinated management control system reforms in the 1980s and early 1990s. These changes included new resource allocation mechanisms, quality measurement initiatives, and organizational structures, but these reforms appear to have been largely unsuccessful (Iglehart 1996; Hollingsworth and Bondy 1990; Weisentstein 1991; Center for Health Services and Policy Reform [CHSPR] 1991; Minority Staff of the Committee on Veterans' Affairs 1997). Such piecemeal reforms failed to shift the VHA from its traditional hospital-centered model to the type of integrated health system advocated under managed care private sector reforms, and more generally failed to improve overall system efficiency and quality of care.

---

[1] See Wruck and Jensen (1994) and Brickley et al. (1995, 1996, 1997). For example, Brickley et al. (1996, 298) describe how Eastman Kodak's decentralization efforts in 1984 were accompanied by weak performance measurement and incentive system changes, and therefore were insufficient to remedy the decline in market value of the company. The authors use Eastman Kodak to illustrate the consequences of uncoordinated corporate reorganization in which the changes in the performance measurement and incentive systems were not aligned with the increased decentralization.

In contrast to these piecemeal changes, the VHA's 1996 reform introduced a set of coordinated organizational and management control system changes.[2] The organizational changes, described by the U.S. General Accounting Office (GAO) as "unprecedented" (GAO 1996a), restructured 173 VHA hospitals into 22 networks with associated community clinics, while concurrent management control changes shifted more authority to the local managers and introduced managerial incentives based on carefully structured performance measures.

We use clinical, workload, and financial data from 1992 to 1998 to examine the effect of the 1996 VHA reform on the targeted objective of improving efficiency, which we measure operationally as delivery of higher or equal quality care at a reduced cost per patient. The strong and consistent patterns of efficiency improvements documented in this study provide support for the theoretical proposition that balancing and coordinating the various elements of organizational architecture, i.e., allocation of decision rights, choice of performance measures and design of reward systems (Brickley et al. 1995), can effectively move even a public sector organization toward performance targets. Our results are consistent with those reported by studies of private enterprise, such as Baker and Wruck (1989), Wruck and Jensen (1994), Treml and Lehn (2000), and Ittner and Larcker (1995). The results also support our conjecture that the failure of previous government management control reforms stemmed, in part, from their addressing only certain components of the entire organizational architecture (Downs and Larkey 1986; Wildavsky 1984; Ittner and Larcker 1998).

Section II presents the organizational architecture (OA) theoretical framework. Section III relates the VHA reorganization to the dimensions of the OA structure and to the more general context of governmental reforms, and then states our research question. Section IV describes our data, variables, and model. We present the analysis and results in Section V and the conclusions in Section VI.

II. THEORETICAL FRAMEWORK

Organizational Architecture

Organizational architecture (OA) is a managerial economics framework for analyzing organizational design (Brickley et al. 1995, 1996) (hereafter, BSZ). The fundamental tenet is that value creation depends on the successful integration of three components, i.e., the assignment of decision rights, choice of performance measures, and design of reward systems. Performance measures and related incentives are of particular interest to accountants because of their central role in the organization's management control system.

Baker and Wruck (1989) document that coordinated organizational changes are associated with improvements in value in leveraged buyouts. Wruck and Jensen (1994), Ittner and Larcker (1995), BSZ (1996), and Treml and Lehn (2000), among others, document that the successful implementation of innovative management techniques, such as total quality management (TQM) and just-in-time (JIT) inventory systems, depends on the broader organizational context, including appropriate performance measures and reward structures (BSZ 1997), as well as the organization's economic environment and strategy. Similarly, Ittner and Larcker (2001, 355) observe that "managerial accounting and control should be viewed as a complete organizational control package consisting of accounting information systems, performance measurement and reward systems, and organizational design, with the choice and performance consequences of these practices a function of the firm's external environment, organizational objectives and strategies."[3]

---

[2] The VHA's 1996 reform followed the 1993 National Performance Review (NPR) and the 1993 Government Performance Results Act (GPRA), which called for federal agencies to decentralize decision making and implement other concurrent control system changes, including strategic performance management and performance incentives (U.S. General Accounting Office [GAO] 1993; National Performance Review 1993).

The *assignment of decision rights* reflects Hayek's (1945) contention that collocation of decision rights with the relevant specific knowledge is a critical determinant of organizational success. In environments with rapidly changing technology and market demands, decentralized organizations that are structured around products, services, customers, or a geographical area are more likely to respond quickly and efficiently to market demands and technological change. For example, Nagar (2002) documents that decision rights are more likely to be assigned to local bank managers in rapidly changing environments. The *performance evaluation system* involves the choice of performance measures and standards to coordinate the efforts of decentralized decision makers, provide feedback to top management for evaluating progress toward strategic objectives and to employees for learning, and establish a basis for assigning rewards and/or penalties. Ittner and Larcker (1998) argue that the choice of performance measures is one of the most important challenges facing organizations. Cavalluzzo and Ittner's study (2004) of performance systems in government agencies emphasizes the link of performance measurement with key OA components. They find that top management's use of performance information and their decision-making accountability are associated with greater performance measurement system development and use.

Reward systems seek to motivate employees to be more productive, to focus on organizational objectives, and to learn (Wruck 2000). A broad consensus from a variety of disciplines concludes that the presence of incentives influences behavior. For example, Banker et al. (2000) document how the introduction of an incentive plan including nonfinancial performance measures in a hotel chain significantly increased performance.

A limited number of empirical studies examine the interaction of organizational architecture components in private sector settings. In addition to Nagar (2002), Demers et al. (2002) document that the design of performance measures and rewards systems in Internet firms is associated with the allocation of decision rights. Wruck and Jensen (1994) and Demers et al. (2002) find support for the proposition that changes in the allocation of decision rights are determined by the cost of knowledge transfer and the location of specific knowledge.

We next provide background on the VHA and describe the VHA transformation in terms of the OA framework. We then explain why institutional features of public enterprises create forces that may limit the VHA's potential for value creation. This leads to our research question.

III. THE VHA'S TRANSFORMATION AND POTENTIAL VALUE CREATION

Background

During our 1992–1998 sample period, the 25.9 million living U.S. veterans constituted roughly 10 percent of the national population.[4] Approximately 9.5 million of these veterans qualified for VHA care, either because they had suffered a service-connected disability, or for veterans without such a disability, because they had income below $21,611.[5] During this period, between 3.1 and 3.7 million veterans received care from the VHA annually. Compared to the overall U.S. population, these veterans were older (average age 56.4 years versus 35.8 for the general population), and they experienced a higher rate of chronic diseases, substance abuse, and mental illness than the general population (Kizer et al. 1997).

---

[3] Jensen (1983), Jensen and Meckling (1992), and Milgrom and Roberts (1992) take a similar approach to designing management control systems in organizations.

[4] This section draws heavily on Kizer et al. (1997).

[5] The maximum income for low-income veterans to qualify for care during our sample period ranged from $18,844 in 1992 to $21,611 in 1997 for veterans with no dependents.

Although service to disabled veterans is a critical feature of the VHA mission, the VHA also serves a much broader constituency. In fact, VHA services have increasingly become an important component of the national safety net for the poor. In 1995, only 12 percent of veterans treated in VHA facilities were treated for service-related disabilities; another 28 percent of patients had service-related disabilities but were treated for conditions unrelated to those disabilities. Finally, most of the remaining 60 percent of veterans receiving VHA care qualified for that care because they did not have sufficient income (Iglehart 1996, 1407). This particular patient profile, together with the fact that many veterans may be eligible for care from other government programs such as Medicare, means that the VHA faced significant challenges in designing a patient care delivery system that maintained quality, operated efficiently, and could compete successfully for patients.[6]

In late 1994 the VHA hired Kenneth W. Kizer as Under-Secretary for Health. Kizer received a mandate to reform the VHA to achieve greater efficiency while also enhancing the quality of care that veterans receive. Kizer's vision for transforming the VHA included implementing the changes in health care delivery that had recently taken place elsewhere in the United States. A physician trained in emergency medicine and public health, Kizer had senior academic experience at two medical schools and seven years of service as Director of the California Department of Health Services. In that capacity, he had leadership experience at the frontier of changes in managed care (Young 2000).

Kizer's arrival in 1994 initiated the transformation of the VHA. Following a number of planning efforts and initial policy changes in late 1994 and early 1995 (i.e., in Fiscal Year 1995, which began on October 1, 1994), the most significant system-wide changes in the VHA appeared in October 1995, with the reorganization of the VHA into 22 integrated networks or Veterans Integrated Service Networks (VISNs). Network directors were named in September 1995 and all were in place by January 29, 1996 (Kizer 1996, 11). A draft of the Network Directors' Performance Contracts (NDPCs) for Fiscal 1996, which featured managerial performance measures and financial incentives, was completed in March 1996. The new VHA budget allocation methodology (Veterans Equitable Resource Allocation, or VERA) was also introduced on a transitional basis during this same period. Figure 1 contrasts the VHA OA before (pre-1996) versus after (1996 and later) the reorganization. Figure 2 summarizes major events and key dates during the initiation of the transformation process.

Next, we present the key elements of the VHA transformation. The first subsection describes the new method of allocating the VHA budget across the 22 networks (VISNs), along with the expanded decision rights of network and hospital managers. The second subsection describes the role of performance measures and financial incentives in the VHA's new management control system designed to hold managers accountable for the resources they received.

New Resource Allocation and Decision Rights

Prior to the 1996 reorganization, approximately 173 VHA hospitals operated largely independently from each other under the central direction of VHA headquarters (Kizer 1996; Perlin et al. 2004, 2). VHA headquarters not only allocated the VHA budget to

---

[6] The VHA can collect reimbursement from private-sector third payers when veterans have such insurance, but the VHA is not permitted to collect reimbursement from other governmental agencies such as Medicare.

FIGURE 1
The VHA Organizational Architecture: Before and After

	Decision Rights	Performance Measures	Rewards
Before Fiscal 1996	• Strategic and operational decisions defined and managed by headquarters • Micromanagement of medical facilities by VA headquarters	• Relatively independent (e.g., financial and quality) performance measurement systems • Idiosyncratic and not used consistently in decision making • Subjective performance evaluations	• Management performance evaluations and rewards not formally linked to performance • Resource allocation to hospitals based on prior-year utilization—services, procedures, hospital days, dollars spent, according to complex rules
Fiscal 1996 and after	• Strategic decisions by headquarters • Operational decisions by geographic network managers	• Performance measured on a defined set of performance measures and targets • Performance measured regularly and consistently • Performance system aligned with strategic goals	• Management contracts for network directors incorporate rewards based on performance targets • Funds allocated to networks rather than to hospitals; allocation based on patient volume per network

individual facilities, but they also dictated many specific local operational decisions such as the allocation of beds and the services provided by individual hospital facilities (Kizer 1995; CHSPR 1991).

The new VERA budget allocation system produced a redistribution of resources to the 22 networks. Prior to VERA, historical precedent strongly influenced how the VHA budget was allocated to regions and facilities across the country. Because the veteran population in recent decades had migrated from the Northeast and Midwest regions of the country toward the South and West, historically based budget allocations became increasingly ineffective in distributing resources. Starting with a transition period in FY1996, VERA replaced the historically based allocation method with a capitated system that allocated resources among the networks based on the number of patients treated and the severity of their condition (Department of Veterans Affairs [DVA] 1997c).[7] In other words, resource

---

[7] Following a transitional period, the VHA fully implemented the VERA mechanism in April 1997 in response to a 1996 Congressional mandate (PL 104-204, section 429). During this same period, the VHA also achieved other legislative changes to allow greater flexibility in patient care (Kizer 1999, 10). The Veterans Health Care Eligibility Reform Act of 1996 (PL 104-262) modified veteran eligibility rules so that the VHA could provide veterans with a more flexible mix of inpatient and outpatient care, consistent with national trends in healthcare delivery. The Act permitted the VHA to treat veterans on either an inpatient or outpatient basis, whereas previous legislation had precluded ambulatory care in many circumstances. The Act also introduced a new system for

(continued on next page)

FIGURE 2
Timeline of Critical Events in the Initial Stages of the VHA Reorganization

March 17, 1995	"Vision For Change," Kizer's plan to reorganize the VHA, is submitted to Congress.
September 5, 1995	Congress authorizes VA to implement the Vision for Change Plan.
September 21, 1995 to January 29, 1996	22 network directors were appointed as of September 21, 1995. Most assumed their positions in October and November 1995 and all were in place by January 29, 1996.
October 1, 1995 (Beginning of Fiscal Year 1996)	VHA transitioned from regional centralized operating structure to 22 integrated networks of hospitals.
March 31, 1996	1996 Draft of Network Director Performance Contract (NDPC), describing objectives, measures, and targets for network directors, was distributed across networks.
March 31, 1996	18 network offices were fully operational and organizational charts had been approved for all networks with recruitment for key network offices in process.

Source: Information from Kizer (1996) and other internal correspondence and documents.

allocation shifted from funding based on physical facilities and historical precedent to funding based on network patient workload from the three previous years (Kizer 1997). During the sample period, VERA budget allocations were based on two capitation rates, a higher rate for Complex Care patients (e.g., spinal cord injuries, long-term care, blind rehabilitation, etc.) and a Basic Care rate for other patients.[8] Besides achieving a more equitable regional distribution of VHA resources, the VERA capitation system created incentives for network managers to use resources more efficiently. For example, the GAO concluded that the VERA capitation rates created incentives for facility managers to use resources efficiently in order to have a surplus with which to fund local initiatives (GAO 1997b, 12).

Footnote 7, continued
enrolling veterans that enabled the VHA to increase access to veterans while ensuring that veterans in higher priority categories (e.g., disabled veterans) receive priority when resource constraints were binding. The law also facilitated VHA contracting for, and selling services to, the private sector. During this period the VHA also made important changes to formal administrative procedures to enhance accountability. For example, in 1995 the VHA transformation team initiated a successful repeal of a 1947 policy that prevented termination of a physician for any reason short of malpractice (Young 2000, 25).

[8] For example, the Complex Care and Basic Care capitation rates were $35,707and $2,596, respectively, in FY1997 and $36,960 and $2,604, respectively, in FY1998.

Prior to the 1996 reorganization, VHA facility managers had limited decision rights. The highly centralized VHA management system severely constrained how network and facility managers could use their superior knowledge of local conditions to employ their resources effectively. The CHSPR observed that "managers at all levels of the organization lack the authority needed to effectively perform assigned tasks," including "the authority to reallocate hospital beds among services to meet the needs of their patients" (CHSPR 1991, 34) creating a "lack of flexibility to local variation" (CHSPR 1991, 17).[9] The CHSPR analysis also criticized the persistent micromanagement that characterized the system as detailed studies by Farber et al. (1977) and Lindsay (1975) had noted earlier.[10]

Interviews we conducted in one network revealed that after the reorganization, VHA facility managers actively coordinated and integrated services with other facilities in their network.[11] The interviewees indicated that prior to the reorganization, physicians generally did not interact with their counterparts in nearby hospitals for research or patient care because they viewed other VHA facilities as competitors. The new network structure provided managers within a network with the incentive (as described in the next subsection) and the authority to consolidate services and refer patients among facilities (Perlin et al. 2004). Less efficient units in one hospital could be closed if another facility within the network could provide the service more efficiently or with higher quality. Services could also be outsourced if private sector providers delivered equivalent services at a lower cost (Kizer 1995).

Following the 1996 transformation, individual hospitals retained their healthcare delivery role but now operated within a network, sharing resources and contributing to network-wide performance objectives. Individual VHA networks adopted a variety of operational and control strategies for managing hospital facilities. Specific management processes were developed in each network. Networks also consolidated facilities within networks based on local circumstances (Lukas et al. 1998; GAO 1997a; DVA 1998b). Hence, a variety of governance, management, and oversight structures emerged across the 22 networks of hospital facilities.[12]

New Performance Measures and Managerial Incentives

To support the new organizational structure, resource allocation, and decision rights assignments, in 1996 the VHA introduced a new management control system featuring revised performance measures and managerial incentives (DVA 1996, 1998a). The new management control system holds network directors and hospital managers accountable for objective measures that are linked to wider VHA strategic targets in the spirit of value-based management (Ittner and Larcker 2001). The new control system organizes a variety of performance measures into domains of cost, access, and quality (technical, customer satisfaction, and functional) based on VHA strategic objectives (Kizer 1996). To demonstrate the central role of the new VHA management control system in the VHA transformation process, we first describe how the VHA transformation plans depict the new management control process, and then explain how those plans were operationalized. To confirm those descriptions, we also report how various parties outside the VHA evaluated the new VHA management control process.

---

[9] The Center for Health Services and Policy Research (CHSPR 1991, 43) also noted an historical "lack of coordination between clinical, administrative, and Information Resource Management Staff within facilities, and limited mutual planning and evaluation between facilities in the field and VACO (VA Central Office)" leading to confusion and duplication. For example, two directors described "sending duplicates of everything" to Regional Field Offices and the headquarters Regional Support Office because of duplication and uncertain delineation of responsibility (CHSPR 1991, 27).

[10] For example, Farber et al. (1977) and Lindsay (1975) describe the VHA constructing new hospital facilities in areas where capacity already exceeded demand while simultaneously failing to provide more beds in locations where demand exceeded capacity, the hiring of political appointees in top management, as well as the funding of facilities based on political influence.

[11] During the period from November 1997 to December 1999, we conducted more than 30 semi-structured interviews in one network on-site or by telephone with personnel at various levels and positions across the VHA, including administration, management, and clinical personnel. We also obtained information less formally via documentation, observation, and interaction with these individuals in the course of collecting data.

[12] For example, one network implemented a balanced scorecard control mechanism (Biro et al. 2003). Similarly, some VISNs adopted relatively flat organizational structures, while others retained more hierarchical levels within their network. The individual structures apparently reflect such local factors as the number of facilities, the leadership style of the VISN director, and the culture of local managers (Charns et al. 1997). Unfortunately, we do not have systematic data characterizing the management control mechanisms adopted in each VHA network.

Management Control in Transformation Plans

In the Preface to *Vision for Change*, the blueprint for transforming the VHA, Kizer (1995) emphasizes that the transformed VHA "provides for a level of accountability not typical of government agencies." He describes the fundamental role that management control systems will play in the new VHA, stressing that, "the new performance measurement and monitoring system ... will ensure accountability in the new organization" and that "performance contracts will be a critical aspect of the proposed reorganization" (Kizer 1995, Chapter 1). He also notes the central role of "a negotiated performance contract with each VISN director as a mechanism for ensuring accountability in the new organization" (Kizer 1995, 62). By linking the performance measures to network managers' financial incentives, the transformed VHA created performance incentives, including financial bonuses, which are rare in public sector organizations. In summarizing his vision for the VHA transformation, Kizer states that "In summary, field units and senior managers will be held accountable for measurable achievements that will result in an improved veterans' health care system. The resulting efficiencies will allow VHA to invest in new ways of providing high quality, efficient ambulatory and inpatient care to better meet veterans' expectations" (Kizer 1995, 64–65).

Kizer's vision of the central role of management control in the VHA transformation is recounted by Thomas Garthwaite, a physician who joined the VHA in 1995, and later succeeded Kizer as Under-Secretary for Health Affairs:

> Performance measurement was a key to making the new vision a reality. The use of performance measurement did several things for us. One, it forced us to have conversations about what's most important, what the real goal is. Secondly, it forced us to say "What would be a measure of that?" and third, it said, "What kind of progress have we made." It gave us the opportunity to chart our progress towards those goals. So, I think, more than anything else, performance measurement really led to the dramatic changes we've seen (Garthwaite 2000).

Management Control during the Transformation

Complementing transformation plans, the actual operation of the VHA management control system also confirmed the central role of management controls in the transformation process. On the first page of *Journey of Change*, a VHA strategy and performance document published in 1997, the VHA emphasizes how the transformation responds to "increased demands for accountability" and how performance measurement plays a key role in achieving that accountability. The VHA's new management control system operated primarily through the new network structure described earlier together with Network Director Performance Contracts (NDPCs). The basis for directors' performance evaluations, the NDPCs established performance expectations for networks and network directors (Perlin 2006). The general structure of directors' performance contracts was revised annually for all directors to reflect changes in strategy and address current management concerns, but each individual director's specific performance targets were subject to annual negotiation with Under-Secretary for Health Kizer during our sample period. Each network manager then signed his individual NDPC to acknowledge acceptance of the contract. These contracts in turn trickled down to the managers within the networks, where network managers negotiated similar formal agreements with facility managers within the networks (DVA 2000, 14).[13]

At the network level, each NDPC included three or four performance categories, using a combination of subjective and objective performance measures.[14] Network directors' "core competencies" such as interpersonal effectiveness, customer service, and systems thinking, were subjectively evaluated in Part A of the contract based on the director's report of actions/accomplishments. Part B of the contract reflected the areas of organizational special concern, including safety, risk management, credentialing and privileging, and fairness of workforce treatment in 1997 (see the Appendix for details). In 1998, the "12 dimensions of the VHA comprehensive framework for quality healthcare," including accreditation, clinical care strategies, performance indicators, internal review, etc., were added to the contract.

Part C was the most significant part of the performance contract. It established specific values for the approximately 15 network objective performance targets for VHA-wide measures "deemed critical to organizational success" (DVA 1996). The VHA transformation team selected these measures as performance drivers of the five "domains" that support the VHA strategic objective of providing "Healthcare Value." The five domains with associated sample performance measures were: cost domain (bed days of care, total operating beds, percentage of ambulatory surgery); access domain (number of priority veterans using VHA services, timeliness of access); technical quality domain (primary care enrollment, compensation and pension requests, chronic disease index [CDI], prevention index [PI], palliative care); veteran satisfaction domain (customer service standards survey score, percentage of satisfied spinal cord injury patients); and functional status domain (Addiction Severity Index).

The specific performance targets for each measure reflected a combination of VHA and network-specific internal standards (e.g., a combination of best performance by any network during the previous year or that network's performance the previous year), as well as external standards such as local Medicare results. We note that cost per patient day, the measure of overall efficiency we employ in this study, is also the general cost metric used in VHA strategic plans. In turn, each of the three specific performance measures in the cost domain are widely used proxies for cost (DVA 1997b). Reductions in bed days of care and total operating beds will translate to reduced capacity costs, while increasing the proportion of surgeries performed on an ambulatory basis should reduce both capacity and operating costs of providing medical care.

---

[13] Contracts for managers within a network could be either identical to or different from the network director's contract. In either case, the general objective was to translate network objectives to managers of product lines or hospitals within the network.

[14] Our description of these contracts is based primarily on the specific features of the 1997 and 1998 NDPCs. The Appendix shows the 1997 Network Directors Performance Contract (NDPC) structure. The VHA performance management office made annual modifications to the NDPC contracts. For example, to be eligible for a bonus in 1996, a network manager had to first perform satisfactorily on a set of organization-specific goals, including establishing strategic plans, clinical guidelines, and other operational requirements. In 1997 the VHA dropped the qualifying measures and defined three categories of measures: core competencies and interpersonal effectiveness, areas of special organizational concern, and performance measures. Within each category, the VHA made minor annual adjustments to reflect current priorities or to improve a metric for a strategic objective. However, over the sample period the VHA retained the same basic contract structure consisting of subjective measures for core competencies and objective measures for key strategic VHA targets, with objective measures used to determine bonus eligibility.

Individual network directors had at least three reasons to focus attention on their network's performance relative to the Part C performance targets. First, this performance was the basis for Kizer's annual performance evaluation of each director. Second, individual network directors sought to have their network perform well relative to other networks because monthly relative performance results for each network were widely reported and followed across the VHA (Perlin 2006). Third, network directors were eligible for annual bonus payments based on their network's performance relative to the targets.

Although we do not have comprehensive data on the distribution of actual bonuses paid to network directors, Kizer has indicated that these annual bonuses ranged from approximately $2,000 to $20,000, with most actual bonus payments in the $2,500 to $10,000 range.[15] Approximately 25–30 percent of senior managers received a monetary performance bonus in a typical year. Trevelyan (2002, 13) reports that shortly after our sample period, network directors received the following range of bonuses: two directors received no bonus; one director received $12,000; eight directors received $15,000; six received $20,000; and five received $24,000. Although perhaps small by some private sector standards, the bonus amounts were not trivial relative to VHA network directors' annual salaries, which would have been generally in the $150,000–$200,000 range. Furthermore, the transformation team firmly believed that the bonuses' primary role was to communicate to network and hospital managers what top management wanted them to do rather than to overcome managers' inclination to shirk (Young 2000, 19). This view was echoed by Kizer, who viewed a director's general desire to perform well on these broadly communicated measures as a more important motivation than the monetary bonus itself.

The significance of the VHA new management control mechanisms was also reflected in interviews we conducted with experienced network-level VHA managers. In comparing control processes before and after the transformation, the managers noted that previously the VHA measured performance extensively and administered many quality improvement programs (DVA 1992a, 1992b). However, these measures were not related to organizational strategy and the quality programs were not integrated into operational performance evaluation processes. As a result, they had only limited influence on patient care. As Kizer (1995, 61) also observed: "Historically, VHA manager performance has been evaluated by a wide variety of inconsistent, often changing indices that were frequently subjective, not measurable and focused more on process than outcome."

In contrast, the same individuals indicated that after the 1996 reorganization, most VHA employees displayed a genuine interest in the monthly performance reports that compared performance across units. The increased attention to the measures appears to be attributable in part to the focus on a relatively small number of key measures (Kizer 1995, 62), the integration of these measures into the NDPCs, and the timely communication of network performance results across the VHA. Kizer (1995, 62) notes: "Important features of these key measures are that they are tightly linked to the organization's goals and its strategic plan for meeting those goals, that they are clearly understood throughout the organization, and that they are related to aspects or activities that can be changed." These performance reports highlighted both progress and problems, thus enabling network managers to focus employees' attention on appropriate issues (Kizer 1995, 62).[16]

---

[15] These amounts are from private communication with Kenneth Kizer.

Perspectives on Management Control from Outside the VHA

In addition to evidence from VHA plans and operations, other research, as well as GAO and Congressional evaluations, offer insight into the role of management control in the VHA transformation. In describing the VHA reorganization between 1995 and 1999, Young (2000, 4) identifies the "establishment of an accountability system" as one of the four fundamental initiatives of the transformation process. Young (2000, 8) goes on to note: "As the centerpiece of a new accountability system, the senior leadership team established performance contracts with upper-level managers."[17] The preceding characterization of the function and operation of the managerial performance bonuses is also confirmed in a management control case based on interviews with VHA managers concerning the VHA transformation (Trevelyan 2002). The case also enforces Kizer's contention that although the financial rewards were important, even stronger incentives were created by peer pressure, personal pride, and performance ratings.

The GAO provided a third external perspective on the importance of the VHA management control system. In reviewing the VHA FY1998 budget proposal, the GAO (1997b, 15) endorsed the VHA new management control system. Based on interviews with network and facility managers, the GAO concluded:

> The VA's new performance measurement process also plays an important guidance role by underscoring VA-wide organizational priorities. These measures include key indicators such as reduced bed-days of care and an increased percentage of surgeries performed on an ambulatory basis. The measures are the main components of the network directors' performance agreements. In the networks we visited, medical center directors' performance agreements also included these measures. Medical center directors we contacted told us that network directors were exercising closer oversight of their progress in achieving VA-wide goals than had occurred under previous organizational structures.[18]

The preceding evidence documents the central role of management control systems in the VHA transformation process. To the extent that the VHA transformation process incorporated coordinated changes in decision rights, performance measures, and incentives, the OA perspective would conclude that this more comprehensive VHA reorganization should be more successful than previous piecemeal VHA reform efforts. At the same time, we note that most of the previous empirical evidence on the success or failure of organizational changes in the spirit of the OA framework comes from for-profit organizations, where value creation is clearly identified with shareholder wealth. Various institutional features of government enterprises may limit the success of applying the OA framework in this setting. We now discuss the potential influence of such institutional features in the context of governmental reforms.

---

[16] However, Young (2000, 16–17) also reports survey results indicating that communication of the transformation's objectives and processes was less successful at lower levels in the VHA than it was among higher-level supervisors.

[17] Although Young (2000) concludes that the VHA transformation was generally successful, he also observes that the overall transformation process, and particularly the change in accountability, was not always smooth. He notes that, "VHA senior leadership team became deeply embroiled in controversy over the accountability system it had established for upper-level managers ... Initially, managers complained bitterly about the adequacy of the data sets, reliability of the measures, and potential opportunities for gaming ... efforts were made to improve databases and measures" (Young 2000, 8). However, senior management persevered with the accountability system and eventually it was extended down in the organization.

[18] The Senate Committee on Appropriations (Report 104-318, 15) also emphasizes the importance of the VHA incentive system and management control process, noting, "The Committee also is supportive of performance measures for VISN and medical center administrators to ensure appropriate incentives for the provision of high quality, cost-effective care. The General Accounting Office recently stated, 'Unlike private care providers, VA bears few of the risks associated with inefficient practices and, as such, has little economic incentive to reduce costs.' Performance measures should help rectify this systematic disincentive."

Institutional Features of Public Enterprise

In private sector organizations where share ownership is transferable, firms that survive will successfully adapt their governance and control systems to changes in the environment such as technology, competition, and regulation (Kole and Lehn 1999). Firms adapt because owners bear the consequences of their actions (Jensen and Meckling 1976; Alchian 1965). The transferability of share ownership provides an incentive for owners to monitor and control management behavior, allows managers who own stock to benefit from the increase in share value generated by their efforts, and creates the threat of takeover for underperforming firms, thus disciplining management (Grossman and Hart 1980; Demsetz and Lehn 1985).

Public enterprises are generally not constrained by these same disciplining forces. Rather, they are created and maintained by a political process driven by the legitimacy concerns of politicians who seek reelection. Individual taxpayers generally lack the incentives and the means to monitor the progress of public enterprise management or to align managerial behavior with the stated objectives. In addition, various political incentives create commitment problems stemming from micromanagement (Lindsay 1975), political turnover (Wildavsky 1984; Light 1997), and political power struggles (Moe 1990), as well as legitimizing behavior (March and Olson 1983; Dirsmith et al. 1980). These same influences also limit the effectiveness of governmental reforms. Studies demonstrating the general inefficiency of public enterprises include Savas (1977) and Lindsay (1975), while other research documents unsuccessful U.S. governmental reforms (U.S. Executive 1912–1914; Arnold 1976, 1974; March and Olson 1983; Light 1997).[19] The VHA itself has a long history of unsuccessful management reforms resulting in persistent patterns of inefficient investments and inappropriate patient services (Farber et al. 1977; Lindsay 1975; Iglehart 1985; CHSPR 1991; Commission on the Future Structure of Veterans Health Care [CFSVHC] 1991). These reforms may have been unsuccessful because they failed to consider the interdependence among the various elements in the organizational architecture (Ittner and Larcker 1998; Downs and Larkey 1986; Wildavsky 1984), which leads to our research question:

> **Research Question:** Did the VHA transformation improve the efficiency and quality of patient care as a result of coordinated changes in the VHA organizational architecture?

To answer this broad research question, we address the two more specific issues that make up the general question. First, we analyze whether the VHA transformation improved the efficiency of patient care, which we measure operationally as delivery of higher or equal quality care at a reduced cost per patient. Second, we provide evidence as to whether this result can be reasonably attributed to the VHA's coordinated changes in organizational architecture. The 1996 reorganization decentralized the VHA operations and concurrently introduced significant management control system changes. Although the OA literature would argue that such changes should enhance value creation in private sector enterprises, a variety of institutional factors may prevent such value creation. For example, if centralized management or other political forces have maintained sufficient control over critical VHA processes and decisions, then the benefits of the intended decentralization and performance evaluation may not be realized.[20]

---

[19] A number of widely publicized innovative performance management initiatives in the U.S. federal bureaucracy, such as zero based budgeting (ZBB), merit pay, management by objective (MBO), and program planning and budgeting system (PPBS), survived only for a short period in the federal government (Dirsmith et al. 1980; Wildavsky 1984; Downs and Larkey 1986).

Systematic analysis of the VHA performance on each of the annual performance measures in NDPCs reveals that substantial improvement did take place during the sample period for most performance measures (Thibodeau 2003; Jha et al. 2003). However, improvement on such performance measures does not necessarily guarantee that the more fundamental strategic objectives of improving the efficiency and quality of care will be met.

First, for various reasons, the financial and nonfinancial measures used in VHA managers' contracts may be noisy and not fully congruent with the VHA fundamental mission (Feltham and Xie 1994). Second, anecdotal evidence suggests that some portion of the improvement on certain nonfinancial measures reflects only improved *documentation* of procedures rather than actual improvements in the underlying activities. Third, the new incentive system may have induced "gaming" behavior to improve measured performance without changing the underlying economic efficiency of VHA operations. For example, the VHA uses the ratio of outpatient-to-inpatient medical and surgical procedures to encourage shifting treatment to less costly outpatient settings. In the drive to show improvement on this performance measure, anecdotal evidence suggests that some VHA physicians delayed scheduling certain procedures until the patient left the hospital, and later recalled the patient for multiple outpatient visits. Rather than reducing cost, such gaming of the performance measures could actually increase costs because the costs of additional tests for a patient already in the hospital might often be less than the cost of generating multiple additional outpatient visits.

To address the more fundamental question of whether the 1996 VHA transformation increased VHA efficiency, we analyze the time-series of cost per patient at individual VHA hospitals over the 1992–1998 fiscal period. Reductions in inflation-adjusted cost per patient over this period would be evidence that the transformation did increase VHA efficiency.

IV. DATA, VARIABLES, AND MODEL SPECIFICATION

Data

We use individual VA hospital facilities (VA Medical Centers [VAMCs]) as our unit of analysis. The data include VAMC-level financial, workload, and clinical measures from the fiscal year ending September 30, 1992 through FY ending September 30, 1998. These data were extracted from VA internal information systems or obtained from VHA analysts. We obtained non-VHA data from public sources, including the Bureau of Economic Analysis and the Centers for Medicare and Medicaid Services (CMS). Our complete panel data set contains facility-level annual data for 138 VAMCs over the seven-year period, for a total data panel of 966 observations.[21]

---

[20] As an example of the role of political forces, a variety of anecdotal evidence demonstrates that Veterans Service Organizations (VSOs), which represent various veteran constituencies, can exert considerable influence over the process by which VERA allocates funds to VHA facilities across the country.

Although the networks created by the reorganization are the main budgeting and operating units, we use hospital-level data to perform our analysis because patient care is delivered at the hospital level. Prior to the reorganization VHA hospitals were organized under a geographic configuration in which four regional offices exercised relatively little authority (CHSPR 1991, 27). In the subsequent discussion of the robustness of our results, we describe the results of a corresponding analysis at the network level.

Variable Definitions

Cost per Patient (COST)

Following research on public sector relative efficiency (e.g., Caves and Christensen 1980; Davies 1971), our primary dependent variable, *COST*, is the VHA annual medical care cost per patient treated by the VHA. The numerator of *COST* is the annual inflation-adjusted operating cost for each hospital facility. We extracted annual medical care expenditures data from the VA's financial information system, and aggregated each facility's total operating expenditures for medical care. The resulting cost measure includes only those patient care costs that are under the control of the VHA managers who are the targets of the VHA reform incentives. These costs include direct hospital medical care, as well as the cost of care in nursing homes, domiciliary care, and care outsourced to non-VA hospitals. We exclude depreciation, research, and allocated corporate overhead. During our sample period, wages represent 67 percent of total operating costs, ranging from 69 percent in 1992 to 62 percent in 1998. Based on sample information from one network, the percentage of total cost for other major cost components includes pharmaceuticals, 16 percent, contractual services, 12 percent, and prosthetics and other medical supplies, 10 percent.

The denominator of our cost per patient measure is the total annual number of unique individual patients treated as an inpatient or outpatient at a VHA facility during that fiscal year. This measure is consistent with the VHA's focus on treating all eligible veterans and with the VHA's resource allocation mechanism that is based on the total number of veterans treated, as opposed, for example, to resource allocations based on counts of inpatient admissions or outpatient treatments.[22]

The third data column of Table 1 reports *COST*, the resulting annual inflation-adjusted average medical care cost per patient over the 138 hospital facilities in our sample.[23] The average annual adjusted cost per patient ranges from approximately $4,100 to $4,700 over the sample period with an overall average of $4,477. These figures are comparable to corresponding results reported internally by the VHA (Management Science Group 2001).

---

[21] The 138 facilities include VA hospital units that were operating following mergers that occurred between 1996 and 1998. For merged facilities, we aggregated the data in the years prior to the merger under the new combined hospital identity to form a comparable panel of hospital units across the seven years.

[22] Similar to a health plan that focuses on controlling cost per enrollee, the VHA focuses on cost per individual patient in evaluating efficiency of operations (Management Science Group 2001; Kizer 1995; Department of Veterans Affairs [DVA] 1997a, 1997b). Therefore, we use the individual patient as the unit of output in the denominator of our cost per patient measure. In contrast, research on the cost of care in non-VHA hospitals has typically used output measures such as total admissions/discharges or total inpatient days, reflecting the hospital's reimbursement based on inpatient days or admissions/discharges (Connor et al. 1998). This literature then often adjusts inpatient costs and services to a combined inpatient and outpatient estimated equivalent.

[23] To adjust for changing price levels, we use the chain-weighted Gross Domestic Product (GDP) deflator. To validate our results, we also used the Employment Cost Index (ECI) in state and federal hospitals as a deflator. Although this index does not account for all costs, it is more specific to the sector and labor expenses account for an average of 67 percent of total costs in the sample period. Results using ECI as a deflator are qualitatively similar to the reported results using the GDP deflator, but with moderately higher coefficient estimates on the post-reorganization-year dummy variables.

Year Indicator Variables

To estimate the effect of the VHA reorganization on the cost per patient measure, we use indicator variables for the years 1993 to 1998. We expect to see the primary effect of the reorganization beginning in 1996, the first year in which the new VISNs, the NDPCs, and the new budget allocation methodology (VERA) were introduced. However, because plans and initial reorganization changes began before 1996, the 1995 indicator variable could potentially reflect some cost reduction. In fact, Kizer (1999, 9) characterizes the VHA transformation process as consisting of three phases, in which the first phase "began in late 1994 and continued through the end of 1995." After joining the VHA in late 1994, Kizer initiated the first phase of the transformation, which focused on defining and analyzing current problems and likely future trends, describing and communicating a plan for change, and developing support for that plan. Because the general direction of much of the VHA transformation was evident early in phase 1 (e.g., shifting more patient care to an outpatient basis and developing strong primary care relationships), some VHA physicians and managers began to introduce changes during phase 1.[24] Therefore, although likely to be smaller in magnitude, it seems reasonable to expect some evidence of cost reductions prior to 1996.

Case Mix Index (CMI), Wage Index (WI), and Teaching Hospitals (TEACH)

We use a Medicare-like case mix index (*CMI*) to control for variations in costs that are due to a hospital's patient mix. This *CMI* is the average Diagnostic Related Group (DRG) weight for patients 65 and older receiving acute care services (i.e., medical, surgical, and neurological bed sections/services). The Medicare *CMI* is a reasonable proxy for case mix for all patients (Connor et al. 1998; Iezzoni 2003) and is widely used in healthcare research (Dranove 1998; Carey 1997). We obtained the *CMI* for VHA hospital facilities from the VHA's Management Science Group (MSG).[25] We include the CMS's wage index (*WI*) of hospital wages across Metropolitan Statistical Areas to control for geographic wage-rate variations (Dranove 1998; Carey 1997; MSG 1993). Finally, most VHA hospitals include a teaching function in conjunction with U.S. medical schools (Kizer et al. 1997). Non-governmental teaching hospitals generally have higher cost structures (Wasserman et al. 2001). Hence, following Yaisawarng and Burgess (2006), we add *TEACH*, an intercept dummy equal to 1 for the 70 hospitals in our sample that were members of the Council of Teaching Hospitals.[26]

Control for Unobservable Factors within Hospitals and Networks

To control for characteristics specific to each of the 22 VHA networks, we include intercept dummies for each VHA hospital network. Also, we include *LAGCOST*, the previous period's cost per patient, to reflect factors specific to individual facilities. Inspection of the condition index and Variance Inflation Factors (VIF) of the regressors does not reveal any serious multicollinearity among the independent variables.

---

[24] In addition, pilot projects for the VHA transformation were introduced in some VHA facilities in FY1995 (President's Budget FY1996, 823).

[25] The *CMI* (case mix index) is the average discharge DRG weight of Medicare patients 65 and older. Because VHA hospitals are not reimbursed by Medicare, there is no VHA-specific case mix index available from Medicare. Therefore, the VHA's Management Science Group developed a VHA-specific index (Management Science Group 1993, 4-4, 1996).

[26] As of 1996, 130 of the 173 VAMCs in operation prior to the merger of hospital facilities had affiliations with U.S. medical schools (Kizer et al. 1997). Our regression results are robust to defining *TEACH* to include all medically affiliated facilities rather than just those hospitals that are members of the Council of Teaching Hospitals.

Controls for Policy Shift from Inpatient Care

Finally, in model 2 we also include a control for the VHA ongoing policy of shifting care from an inpatient to an outpatient basis. Although the 1996 VHA reorganization accelerated this movement from inpatient to outpatient care, the shift toward outpatient care began at a slower rate prior to the 1996 reorganization. Hence, to ensure that our results are not driven by a policy decision initiated before the 1996 reorganization, we use *OUT/IN*, each facility's annual ratio of outpatient visits to inpatient discharges, to reflect the policy of substituting outpatient for inpatient care. The numerator is the total number of outpatient visits, including multiple visits by the same patient. The denominator is the total number of inpatient discharges, including multiple discharges by the same patient.

Model

To test the effect of the VHA reorganization on the efficiency of VHA patient care, we regressed the hospital-level inflation-adjusted cost per patient (*COST*) on the set of indicator variables for the years 1993 to 1998 and our control variables, as described above. Our tests were based on variations of the following basic model using pooled time series data from 138 VAMCs:

$$\begin{aligned} COST_{it} = {} & \alpha + \beta_1 D1993 + \beta_2 D1994 + \beta_3 D1995 + \beta_4 D1996 + \beta_5 D1997 \\ & + \beta_6 D1998 + \gamma_1 CMI_{it} + \gamma_2 WI_{it} + \gamma_3 TEACH_{it} + \sum_{j=1}^{21} \delta_j VISN_j \\ & + \phi_1 LAGCOST_{it} + \phi_2 (OUT/IN)_{it} + \varepsilon_{it} \end{aligned}$$

where:

i = 1,...,138 individual VAMCs (hospitals);
t = 1,...,7 years in the sample period (1992 to 1998);
j = 1,...,22 VISNs, where each VISN is a network of VHA hospitals;
$COST_{it}$ = inflation-adjusted annual operating costs per patient in VAMC i in year t;
$D1993$ = dummy variable equal to 1 for observations in 1993, and 0 otherwise;
$D1994$–$D1998$ = defined per *D1993*;
CMI_{it} = VHA CMI for VAMC i in year t;
WI_{it} = wage index of VAMC i in year t;
$TEACH_i$ = 1 if hospital is member of the Council of Teaching Hospitals, 0 otherwise;
$VISN_j$ = dummy variable for VISN (network) j;
$LAGCOST_{it}$ = one-year-lagged inflation-adjusted annual operating costs per patient in VAMC i in year t; and
$(OUT/IN)_{it}$ = ratio of total outpatient visits to total inpatient discharges in VAMC i in year t.

There is no evidence of significant skewness in the data, and therefore we do not transform the dependent variable. However, inspection of the partial autocorrelation functions (PACFs) and autocorrelation functions (ACFs) suggests that the data follows an autoregressive model with first-order auto-correlated errors (AR1). To control for this autoregressive structure, we either include the lagged cost variable or we use the Prais-Winsten estimator, adding a first-order autoregressive structure on the error term. This estimator is consistent and performs well on short time-series with a trend (Green 1994). We report results using ordinary least squares (OLS) for our main models (Model 1 and Model 2), which include the lagged cost, and we report Prais-Winsten estimates in Model 3, which excludes the lagged cost. Although an inspection of residuals does not suggest serious heteroscedasticity, we also run the regressions with Generalized Estimating Equations (GEE) robust standard errors (Liang and Zeger 1986) with similar results.

V. RESULTS

Descriptive Statistics and Correlations

Table 1 presents descriptive statistics for the 138 hospital facilities over the sample period. The mean and median cost per patient (*COST*) increase over the first half of the sample period and then decline starting in 1995 (mean) and 1996 (median). Similarly, the standard deviation of *COST* initially increases and then decreases. These patterns confirm Kizer's (1995) expectations that the transformation would reduce both average cost and cost variability as individual VISNs focused on improving areas of weaker performance. The results are also consistent with VISNs with higher costs reducing their average cost per patient to a greater extent than other VISNs. The case mix index (*CMI*) generally increases over the sample period, while the wage index (*WI*) remains relatively constant over time. The increase in *OUT/IN* over the sample period reflects the VHA's strategy of shifting care from an inpatient to an outpatient base whenever practical.

Table 2 reports the correlations among the dependent and independent variables. As expected, the correlations show that cost per patient has a positive association with the case mix index (*CMI*) and the wage index (*WI*), a weak negative association with the relative reliance on outpatient versus inpatient care (*OUT/IN*), and a strong positive association with the lagged cost per patient (*LAGCOST*).

Regression Estimates

Table 3 reports the results for three alternative *COST* regression specifications. We first summarize the overall results and then discuss the specific regression details.

The results in Table 3 for the year indicator variables are generally supportive of our research hypothesis that the VHA transformation produced significant efficiency improvements. Specifically, the estimated coefficients on the dummy variables for the years 1996–1998 are always negative and statistically significantly different from zero except for *D1996* in Model 3, which is negative but not significantly different from zero. The 1995 dummy variable, *D1995*, is negative and statistically significant in Models 1 and 2 with a coefficient smaller in absolute value than the estimated coefficients for the 1996–1998 dummies. The 1994 dummy is not significantly different from zero in Models 1 and 2, but in Model 3 it becomes positive and significant, as do the 1993 and 1995 dummies.[27] These results are generally consistent with the VHA change in OA significantly reducing the VHA operating cost per patient following the 1996 reorganization with some evidence of a smaller cost reduction in 1995 before the transformation was fully in progress.

The preceding results hold after controlling for facility level measures of patient case mix complexity (*CMI*), the local wage level (*WI*), the policy shift toward outpatient care

---

[27] The results for Model 3, which excludes the lagged cost and *OUT/PAT* variables, are inconsistent with the corresponding results in Models 1 and 2 in several cases. Specifically, the Model 3 results include positive and significant coefficients on *D1994* and *D1995*, insignificant coefficients on *D1996* and *TEACH*, and a significant coefficient on *WI*. All but the last result are unexpected, suggesting that Model 3 is less well specified than Models 1 and 2.

TABLE 1
Descriptive Statistics

Measures[a]	Annual Operating Cost	Annual Patients	*COST*			*CMI*			*WI*			*OUT/IN*		
Year	Total	Total	Mean	Med.	Std. Dev.	Mean	Med.	Std. Dev.	Mean	Med.	Std. Dev.	Mean	Med.	Std. Dev.
1992	$13,427,728,324	3,059,125	$4,496	$4,195	$1,478	1.088	1.08	0.122	0.965	0.96	0.145	18.44	17.90	5.92
1993	14,011,884,601	3,103,744	4,603	4,357	1,500	1.069	1.06	0.133	0.965	0.96	0.144	18.91	18.35	6.00
1994	14,683,461,178	3,188,549	4,686	4,381	1,454	1.080	1.06	0.139	0.959	0.95	0.156	20.04	19.33	6.27
1995	14,785,266,848	3,248,141	4,607	4,446	1,415	1.085	1.08	0.147	0.957	0.94	0.158	22.31	22.40	6.46
1996	14,510,609,849	3,261,516	4,461	4,267	1,323	1.101	1.09	0.144	0.959	0.95	0.154	25.72	25.37	7.38
1997	14,969,880,501	3,398,146	4,380	4,231	1,191	1.163	1.14	0.176	0.961	0.95	0.155	34.19	32.78	10.11
1998	15,449,175,362	3,705,717	4,107	4,094	977	1.175	1.16	0.192	0.963	0.95	0.155	41.02	38.22	13.72
Average	$14,548,286,666	3,280,705	$4,477	$4,259	$1,353	1.109	1.09	0.157	0.961	0.95	0.152	25.81	23.32	11.62

---

[a] Annual Operating Cost is the annual total direct medical care cost incurred by each veteran hospital, nursing home, and domiciliary facility, including wages, supplies, and pharmacy and excluding depreciation, research, and allocated corporate overhead plus the cost incurred for care outsourced to non-VA hospitals. Costs are adjusted for inflation using the chain-weighted GDP growth rate using 1996 as the base year. Annual Patients is the total number of unique individual patients who were treated at least once during the year by the VHA. *COST* (cost per patient) is the total annual inflation-adjusted operating cost divided by total annual number of unique individual patients treated at least once during the year by a VHA hospital facility. *CMI* is a Medicare-like DRG-based case mix index computed by the VHA for VHA hospitals. *WI* (wage index) is a cross-sectional index computed by CMS that accounts for geographical variations in wages. *OUT/IN* is the ratio of total outpatient visits to total inpatient discharges in VA Medical Centers.

n = 966 except *OUT/IN* where n = 938 because we exclude very high outlier facilities.

TABLE 2
Correlation Matrix

Variables[a]	*COST*	*D1993*	*D1994*	*D1995*	*D1996*	*D1997*	*D1998*	*CMI*	*WI*	*OUT/IN*	*LAGCOST*
COST	1										
D1993	0.038	1									
D1994	0.063**	−0.167***	1								
D1995	0.039	−0.167***	−0.167***	1							
D1996	−0.005	−0.167***	−0.167***	−0.167***	1						
D1997	−0.029	−0.167***	−0.167***	−0.167***	−0.167***	1					
D1998	−0.112***	−0.167***	−0.167***	−0.167***	−0.167***	−0.167***	1				
CMI	0.113***	−0.104***	−0.075***	−0.062**	−0.021	0.142***	0.173***	1			
WI	0.373**	0.009	−0.007	−0.012	−0.006	0.000***	0.005	0.300***	1		
OUT/IN	−0.068*	−0.031	−0.030	−0.001	0.035	0.018	0.036	−0.043*	0.116***	1	
LAGCOST	0.969***	−0.014	0.021	0.047*	0.022	−0.025	−0.051*	0.110***	0.378***	−0.053**	1

***, **, * Indicate that the coefficient estimate is significantly different from zero at the 1 percent, 5 percent, and 10 percent levels, respectively, one-tailed test.

[a] *COST* (cost per patient) is defined as the total annual inflation-adjusted operating cost divided by total annual number of unique individual patients treated at least once during the year by a VHA hospital facility. Cost is adjusted for inflation using the chain-weighted GDP growth rate using 1996 as the base year. *D1993–D1998* are intercept year dummy variables, defined as 1 if the observation is for the year, 0 otherwise. *CMI* is a Medicare-like DRG-based case mix index computed by the VHA for VHA hospitals. *WI* (wage index) is a cross-sectional index computed by CMS that accounts for geographical variations in wages. *LAGCOST* is the one-year lag of *COST*. *OUT/IN* is the ratio of total outpatient visits to total inpatient discharges in VHA hospital facilities.

TABLE 3
Regression Analysis of Effect of the Reorganization on Cost per Patient[a]

$$COST_{it} = \alpha + \beta_1 D1993 + \beta_2 D1994 + \beta_3 D1995 + \beta_4 D1996 + \beta_5 D1997 + \beta_6 D1998$$
$$+ \gamma_1 CMI_{it} + \gamma_2 WI_{it} + \gamma_3 TEACH_{it} + \sum_{j=1}^{21} \delta_j VISN_j + \phi_1 LAGCOST_{it}$$
$$+ \phi_2 (OUT/IN)_{it} + \varepsilon_{it}$$

Independent Variables	**Model 1 Coefficient (t)[b]**	**Model 2 Coefficient (t)[b]**	**Model 3 Coefficient (t)[b]**
D1993			127.749 (2.377)***
D1994	−17.266 (−0.486)	−16.867 (−0.476)	212.389 (3.088)***
D1995	−173.780 (−4.885)***	−171.731 (−4.834)***	132.206 (1.759)*
D1996	−250.308 (−7.027)***	−246.435 (−6.921)***	−32.806 (−0.436)
D1997	−213.495 (−5.864)***	−210.222 (−5.779)***	−181.754 (−2.526)***
D1998	−414.659 (−11.313)***	−410.516 (−11.203)***	−470.094 (−7.988)***
CMI	240.018 (2.827)***	231.202 (2.725)***	1,005.501 (3.574)***
WI	0.001 (0.104)	0.003 (0.257)	0.198 (4.650)***
TEACH	51.034 (1.815)**	47.054 (1.721)**	−68.105 (−0.679)
VISN	Included	Included	Included
LAGCOST	0.916 (103.764)***	0.914 (103.344)***	
OUT/IN		−0.039 (−1.995)**	
Intercept	273.991 (2.148)***	265.981 (2.148)***	2,160.693 (4.277)***
Adjusted R^2	0.951	0.951	0.265
n	828	828	966

***, **, * Indicate that the coefficient estimate is significantly different from zero at the 1 percent, 5 percent and 10 percent levels, respectively, two-tailed.

[a] The dependent variable, $COST_{it}$, is the cost per patient in hospital i, $i = 1$ to 138 in year t, $t = 1$ to 7. Cost is defined as the total annual inflation-adjusted operating cost divided by total annual number of unique individual patients treated at least once in that VHA hospital in that year. Cost is adjusted for inflation using the chain-weighted GDP growth rate. *D1993–D1998* are intercept year dummy variables, defined as 1 if the observation is for the year, 0 otherwise. *CMI* (case mix index) is a Medicare-like DRG-based case mix index computed by the VHA for VHA hospitals. *WI* (wage index) is a cross-sectional index computed by CMS that accounts for geographical variations in wages. *TEACH* takes on the value of 1 if the hospital is a member of the Council of Teaching Hospitals in the year, 0 otherwise. *VISN* takes on the value of 1 if hospital i is located in network j, $j = 1$ to 22. *LAGCOST* is the one-year lag of *COST*. *OUT/IN* is the ratio of total outpatient visits to total inpatient discharges. Models (1) and (2) estimates are from OLS regressions. Model (3) coefficient estimates are obtained from the Prais-Winsten estimator.

[b] Mixed models that include a regional random-effects term to account for the correlation among hospitals within the same network, in addition to the first-order autoregressive structure, yield almost identical results. Regressions using the Employment Cost Index to deflate costs yield similar results on significance with slightly higher coefficient estimates.

(*OUT/IN*), VISN-specific effects, and lagged cost per patient. With these controls included, the effect of the VHA 1996 reorganization on cost per patient is economically significant and it appears to have increased over the sample period. We now discuss these results in further detail.

In Model 1 of Table 3, the estimated coefficients on the dummy variables for the post-OA years 1996–1998, as well as the dummy for 1995, are all negative and statistically significantly different from zero at the 1 percent level. The estimated coefficient for the pre-OA 1994 dummy is not significantly different from zero. Further, the estimated annual cost savings per patient (i.e., the indicator variable coefficients), are increasing over time except between 1996 and 1997. The control variables for patient mix complexity (*CMI*), teaching hospital (*TEACH*), and lagged cost (*LAGCOST*) have the expected positive signs and are statistically significant at the 1 percent level or 5 percent level (*TEACH*). The wage index (*WI*) has the expected positive sign but is not statistically significant.

The results for Model 2 of Table 3 show that adding a control variable for the mix of outpatient versus inpatient care (*OUT/IN*) leaves the results from Model 1 virtually unchanged. Finally, in Model 3 we examine the effect of dropping the lagged cost and *OUT/IN* variables. As expected, without the lagged cost Model 3's overall explanatory power (adjusted $R^2 = 0.265$) is much weaker than that for Models 1 and 2 (adjusted $R^2 = 0.951$). However, the general pattern of results with respect to the post-OA dummies remains unchanged. The post-OA dummy variables for 1996–1998 are all negative, although only the 1997 and 1998 dummies are statistically significant.

Based on the results for Model 1, we estimate that the reorganization yielded annual reductions in operating cost per patient of $250 in 1996, $213 in 1997, and $415 in 1998. In addition, annual costs also declined by an estimated $174 per patient in 1995 before most of the reorganization became fully effective. These results show that the estimated magnitude of the OA effect is clearly economically significant. For example, applying the estimated total OA cost reduction in Fiscal 1996 of $250 per patient to the 3.26 million total VHA patients (Table 1) yields an estimated annual savings of more than $800 million, which increases to $415 per patient or approximately $1.5 billion annually based on 3.7 million patients in 1998. That amount represents roughly 9.7 percent of the VHA annual operating costs of $15.5 billion in 1998.

In summary, the regression estimates reveal a statistically and economically significant cost per patient reduction in the year of the OA reorganization (1996) and in the following two years. Before discussing the VHA-specific factors that may explain the observed reduction in cost per patient, we next provide further checks on the robustness of the preceding results.

Robustness Analysis

We performed a variety of additional analyses of the robustness of the preceding results. First, we replaced the levels specification in Table 3 with a changes specification in which the dependent variable was the annual percentage change in cost per patient at each hospital. The results for the changes specification in Table 4 show that the general results with respect to the year dummies from the levels specification in Table 3 continue to hold, but the overall explanatory power of the model is reduced, as expected. Except for the lagged cost, the control variables retain the same signs and general significance levels as in the levels models. Likewise, for all three models in Table 4 the coefficient estimates on the effect of the reorganization in 1995 to 1998 (*D1995–D1998*) remain highly statistically significant with the expected negative signs, and the 1994 intercept dummy remains insignificant. Finally, the estimated annual cost reduction magnitudes also remain economically significant, as indicated by the coefficient estimates in Model 1 that range from −0.036 for *D1995* to −0.072 for *D1998*, reflecting annual cost reductions of approximately 3.6 percent to 7.2 percent.

Second, to examine the effect of using networks rather than hospitals as the level of analysis, we repeated the analysis in Table 3 using annual average cost per patient for each of the 22 networks as the dependent variable rather than annual average cost per patient for each hospital. We adjusted most independent variables in a similar manner, but dropped *WI*, *TEACH*, and *VISN* because they are not appropriate measures at the network level. The

TABLE 4
Regression Analysis of Effect of the Reorganization on Inflation-Adjusted Changes in Cost per Patient[a]

$$\%\Delta COST_{it} = \alpha + \beta_1 D1994 + \beta_2 D1995 + \beta_3 D1996 + \beta_4 D1997 + \beta_5 D1998 + \gamma_1 \%\Delta CMI_{it} + \gamma_2 \%\Delta WI_{it} + \gamma_3 TEACH_{it} + \sum_{j=1}^{21} \delta_j VISN_j + \phi_1 \%\Delta LAGCOST_{it} + \phi_2 \%\Delta(OUT/IN)_{it} + \varepsilon_{it}$$

Independent Variables	Model 1 Coefficient (t)[b]	Model 2 Coefficient (t)[b]	Model 3 Coefficient (t)[b]
D1994			−0.006 (−0.784)
D1995	−0.036 (−4.519)***	−0.034 (−4.220)***	−0.042 (−5.624)***
D1996	−0.048 (−6.042)***	−0.047 (−5.946)***	−0.056 (−7.282)***
D1997	−0.034 (−4.051)***	−0.031 (−3.709)***	−0.041 (−5.106)***
D1998	−0.072 (−8.718)***	−0.070 (−8.498)***	−0.079 (−10.425)***
%ΔCMI	0.113 (2.231)***	0.112 (2.243)**	0.101 (2.321)**
%ΔWI	−0.036 (−0.396)	−0.040 (−0.438)	−0.059 (−0.673)
TEACH	0.011 (2.128)**	0.009 (1.820)	−0.012 (−2.608)***
VISN	Included	Included	Included
%ΔLAGCOST	−0.047 (−1.088)	−0.058 (−1.362)	
%ΔOUT/IN		−0.009 (−4.055)***	
Intercept	0.017 (−1.548)	0.017 (1.644)*	0.024 (2.364)**
Adjusted R^2	0.177	0.197	0.197
n	690	690	828

***, **, * Indicate that the coefficient estimate is significantly different from zero at the 1 percent, 5 percent, and 10 percent levels, respectively, two-tailed.

[a] The dependent variable, *%ΔCOST*, is the percent change in cost per patient in hospital facility, *i*, in year *t*. *%ΔCMI*, *%ΔWI*, *%ΔLAGCOST*, *%ΔOUT/IN* are the percent change in the *CMI*, the *WI*, the lagged cost, and the ratio of outpatients to inpatients respectively. Refer to Table 3 for a definition of these measures. Models (1) and (2) estimates are from OLS regressions. Model (3) coefficient estimates are obtained from the Prais-Winsten estimator.

[b] Mixed models that include a regional random-effects term to account for the correlation among hospitals within the same network, in addition to the first-order autoregressive structure, yield almost identical results. Regressions using the Employment Cost Index to deflate costs yield similar results on significance with slightly higher coefficient estimates.

results for the network-level analysis (not reported) for the indicator variables for years 1994–1998 are qualitatively very similar to those in Table 3 at the hospital level in terms of the sign, magnitude, and statistical significance of the coefficients.

Third, as an alternative control for the dependence among hospitals within each network, we repeated the analysis of each model in Table 3 after replacing the fixed-effects network dummy variables with random-effects terms for clustering network errors. The results (not reported) for the indicator variables for years 1994–1998 are qualitatively very similar to those in Table 3 in terms of the sign, magnitude, and statistical significance of the coefficients.

Fourth, to control for potential variations in hospital-level capacity, we repeated the analysis in Table 3 after adding the variable *BEDS*, which is the total number of beds in operation in each hospital in each year, as a measure of capacity. The results (not reported) show that *BEDS* is positive and significant in all three models, as expected. The year indicator variables for 1994 to 1998 remain negative and statistically significant at the 0.01 level for Models 1 and 2. Model 3, which drops the lagged cost and the outpatient/inpatient ratio, has lower explanatory power (adjusted $R^2 = 0.466$ versus 0.952 for Models 1 and 2) and the year indicator variables are generally not significantly different from zero except for 1993 and 1994, which are positive and significant, and 1998, which is negative and significant. The estimated coefficient on *BEDS* in Model 3 is much larger and more statistically significant than the corresponding coefficients in Models 1 and 2. The results in Model 3 are consistent with *BEDS*, which declined over time, absorbing some of the explanatory power of the year indicator variables in Model 3.[28]

Explanations for the VHA Reduction in Cost per Patient

The VHA's significant reduction in cost per patient over the sample period reflects improvements in operating efficiency and capacity utilization, as well as other potential factors that we discuss below.[29] Hospital capacity is commonly measured by the number of beds in service, which the VHA reduced from 89,000 in 1990 to 47,000 in 1998, with 31 percent of this reduction occurring between 1996 and 1998. More significantly, the VHA also closed facilities as hospital networks consolidated resources and merged hospital units. By 1998, facility integrations had closed 20 percent of all VHA facilities, thereby generating significant cost savings (Lukas et al. 1998). Likewise, total VHA employment also declined from 200,900 in 1994 to 179,000 by the end of 1998, an 11 percent reduction, as noted by Kizer (1999, 6). These reductions illustrate Jensen's (1993) contention that when capital markets do not discipline firms for investing in excess capacity, internal control systems and governance mechanisms must perform that role.

In addition to capacity reductions, data on a variety of operational measures reflect increased efficiency in resource utilization across hospital networks following the reorganization. For example, bed-days of care per 1,000 patients decreased by 47 percent between FY1995 and FY1998, including 26 percent and 19 percent decreases in 1997 and 1998, respectively. During the same period, annual inpatient admissions decreased by 27 percent, including a 16 percent decrease in 1997, while the percentage of ambulatory care procedures more than doubled, from 39 percent to 79 percent. Further, the role of primary care increased between FY1994, when 20 percent of VHA patients could identify their primary caregiver, to FY1998, when 78 percent of patients could do so. Similarly, outpatient visits increased by 25 percent between FY1995 and FY1998. Finally, Iglehart (1996, 1408) reports a concurrent 25 percent (200 positions) reduction in the VHA headquarters staff.

Besides improved operating efficiency and capacity utilization, some of the cost reduction could also potentially reflect a shift in the VHA's patient mix toward treatment of a higher percentage of low-cost patients. The VERA capitation system that operated in FY1997 and 1998 created potential incentives for VHA networks and facilities to attract new, low-cost patients because the capitation rates provided the network with more resources than would be required to treat most low-cost patients. Hence, by attracting additional low-cost patients, a network would receive increased resources in excess of expected incremental costs. If such an effect were large enough, it could play an important role in the VHA's documented reduction in cost per patient.

---

[28] Because the decline in *BEDS* over the sample period reflects the VHA effort to reduce capacity in order to reduce cost, *BEDS* reflects an endogenous outcome of the VHA transformation as opposed to serving as a control for conditions exogenous to the transformation process.

[29] Two additional factors that may have contributed to the documented increase in VHA efficiency are ongoing national trends in health care delivery and the VHA's advances in the use of computerized patient records. To attempt to control for the first factor, an earlier version of this study estimated the changes in cost of patient care over the same period for a control sample of California hospitals. The results revealed no corresponding evidence of cost reduction. However, because of the difficulty in adjusting for differences in patient characteristics and in specific cost measures, we do not report that analysis in this paper. See Perlin et al. (2004) for a discussion of the important role of information technology in the VHA transformation.

To assess the relative magnitude of this potential effect, we use statistics from a VHA study that reported the number of "single encounter Basic Care patients" who were treated during the period FY1993–FY1997 (DVA 2003, 106). Single-encounter Basic Care patients are representative of "low-cost" patients because their treatment is generally less costly and they make minimal (one encounter) use of VHA facilities. The study compares results for three overlapping three-year periods, FY1993–95, FY1994–96, and FY1995–97. Although the study finds evidence of variation in the proportion of low-cost patients across networks, the results reveal essentially no increase in the VHA-wide proportion of low-cost patients over this period. More specifically, single encounter Basic Care patients accounted for "about 12.5 percent to 13 percent of the Basic Care workload in each of the three previously mentioned three-year groups" (DVA 2003, 106).[30] Because this evidence includes one three-year period entirely before the VHA FY1996 transformation (FY1993–95), as well as one period with two of three years after the transformation began (FY1995–97), the results suggest that the proportion of low-cost patients did not increase significantly over our sample period.[31] In turn, this suggests that the documented reduction in cost per patient does not appear to be driven by a significant shift in patient mix toward more low-cost patients.

Effects of the Reorganization on Quality

This section provides evidence that the VHA generally did not increase efficiency by systematically sacrificing the overall quality of patient care over the sample period. The quality of care improved significantly for a number of measures during the sample period, but deteriorated for a smaller set of measures.

We consider two categories of quality measures. First, we examine performance on nine quality indicators that are included in the Network Directors Performance Contracts (NDPCs), and for which we have data at the network level. Second, we examine six additional quality measures that are not included in the NDPCs. These latter measures provide a more conservative test of the impact of the 1996 VHA transformation on quality because VHA managers did not have direct contractual incentives to improve them.

As discussed in Section III and the Appendix, the quality measures included in Part C of the NDPCs represent widely accepted industry standards of outcome and process quality, including measures of patient satisfaction, and statistics on processes such as clinical practice guidelines, patient screening procedures, and patient follow-up procedures. However, because the VHA did not collect data on most of these measures prior to the reorganization, we can examine how the indicators changed starting in 1996, but we cannot compare results on the quality indicators before versus after the reorganization.

---

[30] The VHA conducted this study in response to a GAO concern that the VERA capitation system was not allocating resources to networks equitably because of variation in the proportion of low-cost patients across networks (DVA 2003, 106). Hence, although the study found that the overall percentage of such low-cost patients across all networks did not change significantly over time, the study did establish that the proportion of such patients did vary significantly across networks. This concern ultimately led to the introduction of a third capitation rate for low-intensity patients in FY1999 and subsequent further refinements to the capitation system in FY2000 and later years.

[31] Further support for this conclusion is the fact that the mean and median case mix indices of VHA patients increased over the sample period, consistent with an increasingly complex patient mix and inconsistent with a major influx of patients without significant medical problems.

Table 5 reports the average annual performance across the VHA networks on the nine quality indicators in the NDPCs from 1996 to 1998, along with a description of each indicator. Indicators 1 through 8 measure performance as a percentage, whereas indicator 9 is a count of practice guidelines implemented. For example, in 1997 the 77 percent

TABLE 5

VHA-Wide Average Performance on Quality Indicators Included in Network Director Performance Contracts (NDPCs)[a]

Quality Indicator	1996	1997	1998
1. Primary care enrollment	72%	77%	78%
2. Customer service satisfaction: Percentage of problems reported (*lower is better*)	25%	22%	17%
3. Timeliness of access: Percentage of CSS timely access problems (*lower is better*)	24%[b]	15%	11%[c]
4. Palliative care (end-of-life) planning	Measure Not Available[b]	67%	91%
5. Chronic Disease Index (CDI)	44%[b]	77%	85%
6. Prevention Index (PI)	34%[b]	67%	79%
7. Psychiatric care follow-up	60%[b]	63%[b]	72%
8. Addiction severity index (ASI)	Measure Not Available[b]	60%	80%
9. Clinical practice guidelines	5	10	Measure Not Comparable(c)

Definitions of Quality Indicators:

1. Primary care enrollment is the percentage of patients followed by a primary care physician.
2. Customer service satisfaction is the percentage of problems reported from patient satisfaction surveys (lower is better). The survey is based on the Picker Institute CSS (Customer Service Standards).
3. Timeliness of access is the CSS score, which measures the average number of access problems reported per network patient on the timeliness of access in the patient satisfaction survey (lower is better).
4. Palliative care is the percentage of patients with terminal diagnoses or conditions who receive ongoing care through the VHA.
5. The Chronic Disease Index (CDI) aggregates data regarding how well the VHA implements 14 specific care processes recommended in nationally recognized patient care guidelines for five high-volume diagnoses.
6. The Prevention Index (PI) aggregates data regarding how well the VHA implements nine clinical interventions nationally recognized as important primary prevention and early detection strategies for eight diseases with major social consequences.
7. Psychiatric care follow-up measures the rate of return for follow-up care following psychiatric treatment.
8. Addiction Severity Index (ASI) is a standardized measure of functional status of veterans with a primary diagnosis of substance abuse. The performance measure is the percentage of veterans treated for substance abuse during the year who have at least one ASI on record.
9. Clinical practice guidelines track the VHA implementation of specific nationally and VHA-recognized clinical practice guidelines.

[a] Not all measures listed in the NDPCs are included above due to data availability issues, and we have recategorized a few measures.

[b] In 1996, the Palliative Care and Addiction Severity Index measures were not included in the NDPCs and performance data were not published in the performance reports. Other measures were not included in NDPCs in certain years (particularly 1996). Performance on these measures in the non-contractual years was either reported in the performance reports or readily available from another source and, thus, we have included these data for comparative purposes.

[c] The performance metric used for clinical practice guidelines in 1998 is not comparable to that of 1996 and 1997.

performance on measure number 1, primary care enrollment, indicates that 77 percent of VHA patients had a primary-care physician. For all measures except 2 and 3, higher scores reflect better performance. Indicators 2 and 3 reflect rates of customer satisfaction problems, so lower values indicate better performance.

For the first eight measures in Table 5, there is potential to observe year-to-year improvement in 14 cases, comprised of six measures for which we can compare 1996 to 1997 performance (two measures were not available in 1996), and eight measures for which we can compare 1997 to 1998 performance (the clinical practice guideline measure is not comparable across years). In all 14 of these cases, the performance on the measures improved, with a magnitude of improvement ranging from 1 to 33 percentage points.

Our second analysis of the effect of the transformation on quality uses other key quality indicators tracked by the VHA and recognized as important in the healthcare industry, but not included in the NDPCs. We focus on six indicators for which the VHA compiled data at the facility level from 1990 to 1997. The first three are rates of non-return for follow-up care after discharge from (1) substance abuse, (2) psychiatric, and (3) surgical/medical care. The last three are rates of (4) mortality 30 days after discharge, (5) acquired bed-pressure sores, and (6) dehydration in nursing home and intermediary care facilities. The three non-return rates measure the extent to which, following inpatient treatment, patients *fail to return* to be treated on an outpatient basis as called for in clinical care guidelines. Therefore, *lower rates* of non-return reflect closer adherence to practice guidelines, and hence *better quality care*. Using the same approach as in our analysis of cost per patient, we used annual facility-level data to run separate time-series regressions using each of the six quality indicators as a dependent variable. We regressed each quality indicator on intercept dummies for the years 1991 to 1997, controlling for changes in patient case mix, wage levels, teaching hospitals, and network-specific effects, as well as first-order autocorrelation using the Prais-Winsten estimator, as specified in the following equation:[32]

$$\begin{aligned} QUALITY_{it} = {} & \alpha + \beta_1 D1991 + \beta_2 D1992 + \beta_3 D1993 + \beta_4 D1994 + \beta_5 D1995 \\ & + \beta_6 D1996 + \beta_7 D1997 + \gamma_1 CMI_{it} + \gamma_2 WI_{it} + \gamma_3 TEACH_{it} \\ & + \sum_{j=1}^{21} \delta_j VISN_j + \varepsilon_{ij}. \end{aligned}$$

The results in Panels A and B of Table 6 indicate that quality improved on two of the six measures, remained unchanged for two measures, and deteriorated for the remaining two measures. Panel A reveals significant improvements (i.e., decreases) in the non-return rates for substance abuse and psychiatric care over the 1996–1997 period. We note that these rates were already declining prior to the VHA transformation, as indicated by the significant declines in the non-return rates for 1991–1995. The results in Panel B of Table 6 generally reveal no significant change for two quality measures, rate of acquired bed-pressure sores, and rate of acquired dehydration. The signs on the year dummies for these two rates are generally negative but not statistically significant before or after the VHA transformation. Finally, Table 6 shows that quality of care declined on two measures. The

---

[32] We also ran the same regression models removing the fixed effects, network intercept dummies, and adding a regional random effects term instead in the model to take into account the correlation between hospitals within the same network, while specifying a first-order autoregressive structure on the error term. The results of this mixed model are almost identical to those of the Prais-Winsten estimator presented in Table 6.

TABLE 6
Time-Series Regression Results of Alternative Quality Indicators

Panel A: Quality Indicators 1 to 3

$$QUALITY_{it} = \alpha + \beta_1 D1991 + \beta_2 D1992 + \beta_3 D1993 + \beta_4 D1994 + \beta_5 D1995 + \beta_6 D1996 + \beta_7 D1997 + \gamma_1 CMI_{it} + \gamma_2 WI_{it} + \gamma_3 TEACH_{it} + \sum_{j=1}^{21} \delta_j VISN_j + \varepsilon_{ij}.$$

Quality Indicators[a]	(1) Rate of Non-Return for Follow-Up on Substance Abuse Care		(2) Rate of Non-Return for Follow-Up on Psychiatric Care		(3) Rate of Non-Return for Follow-Up on Surgical/Medical Care	
Independent Variables[b]	Coefficient (t)[c]		Coefficient (t)		Coefficient (t)	
D1991	−0.048	(−4.039)***	−0.020	(−1.748)*	0.014	(1.741)*
D1992	−0.070	(−5.926)***	−0.039	(−3.364)***	0.017	(2.240)**
D1993	−0.080	(−6.790)***	−0.032	(−2.787)***	0.022	(2.863)*
D1994	−0.086	(−7.294)***	−0.040	(−3.407)***	−0.020	(−2.621)*
D1995	−0.101	(−8.482)***	−0.049	(−4.222)***	0.003	(0.441)
D1996	−0.120	(−10.078)***	−0.067	(−5.723)***	0.031	(4.019)***
D1997	−0.156	(−12.575)***	−0.091	(−7.540)***	0.048	(5.921)***
CMI	−0.056	(−1.762)*	−0.033	(−1.106)	−0.232	(−12.080)***
WI	−8.7E–06	(−2.267)**	−9.2E–06	(−2.722)***	−8.3E–06	(−3.751)***
TEACH	−0.039	(−4.257)***	−0.004	(−0.490)	−0.025	(−4.543)***
VISN	Included		Included		Included	
Intercept	0.756	(16.127)***	0.515	(12.669)***	0.644	(24.271)**
Adj. R^2	0.426		0.273		0.437	
n	1096		1096		1096	

Panel B: Quality Indicators 4 to 6

$$QUALITY_{it} = \alpha + \beta_1 D1991 + \beta_2 D1992 + \beta_3 D1993 + \beta_4 D1994 + \beta_5 D1995 + \beta_6 D1996 + \beta_7 D1997 + \gamma_1 CMI_{it} + \gamma_2 WI_{it} + \gamma_3 TEACH_{it} + \sum_{j=1}^{21} \delta_j VISN_j + \varepsilon_{ij}.$$

Quality Indicators[d]	Rate of Mortality		Rate of Acquired Bed-Pressure Sores		Rate of Acquired Dehydration	
Independent Variables[b]	Coefficient (t)[c]		Coefficient (t)		Coefficient (t)	
D1991	−0.003	(−1.655)*	−0.003	(−0.193)	0.001	(0.146)
D1992	−0.004	(−2.001)**	−0.029	(−1.781)*	−0.003	(−0.311)
D1993	−0.004	(−2.264)**	−0.014	(−0.888)	−0.011	(−1.237)
D1994	−0.004	(−2.044)**	−0.038	(−2.381)**	−0.011	(−1.219)
D1995	−0.002	(−1.310)	−0.032	(−1.907)*	−0.013	(−1.369)
D1996	0.001	(0.645)	−0.019	(−1.146)	−0.011	(−1.191)
D1997	0.011	(6.092)***	−0.022	(−1.273)	−0.006	(−0.582)
CMI	−0.012	(−2.687)***	−0.033	(−0.795)	0.020	(0.781)
WI	−1.2E–05	(−2.051)**	−1.2E–05	(−2.524)**	−2.6E–06	(−0.817)

(*continued on next page*)

TABLE 6 (continued)

TEACH	−0.001	(−0.693)	−0.028	(−2.401)**	0.007	(0.980)
VISN	Included		Included		Included	
Intercept	0.756	(16.127)***	2.268	(4.702)	0.066	(1.749)*
Adj. R^2	0.427		0.043		0.192	
n	1096		796		796	

***, **, * Indicate that the coefficient estimate is significantly different from zero at the 1 percent, 5 percent, and 10 percent levels, respectively, two-tailed.

[a] The dependent variables are quality indicators that measure the rate of non-return for a follow-up following: (1) Substance abuse care, (2) Psychiatric care, and (3) Surgical or medical care. In all cases lower rates reflect better quality care.

[b] *D1991–D1997* are intercept year dummy variables, defined as 1 if the observation is for the year, 0 otherwise. Refer to Table 3 for a definition of the other independent variables in the model.

[c] Prais-Winsten regression estimates. Mixed models that include a regional random effects term to account for the correlation among hospitals within the same network, in addition to the first-order autoregressive structure, yield almost identical results.

[d] The dependent variables are quality indicators that measure the rate of (1) mortality 30 days after discharge from a VA facility, (2) acquired bed-pressure sores in nursing home and intermediary care units, and (3) acquired dehydration in nursing home and intermediary care units. In all cases lower rates reflect better quality care.

non-return rates following surgical/medical procedures increased significantly in 1996 and 1997 (Panel A) and the rate of mortality 30 days after discharge increased significantly in 1997 after a pattern of smaller improvements prior to the VHA transformation (Panel B).

The increasing complexity of patients admitted to VHA hospitals over the study period (Ashton et al. 2003), combined with the limited ability of case mix indices to adjust for severity (Iezzoni 2003), may explain the observed positive coefficient on the 1997 mortality rate. That is, the increase in complexity of hospitalized patients over time would be associated with an increase in mortality. If this increase in complexity is incompletely accounted for by the case mix index in our model,[33,34] then there would be a residual apparent increase in adjusted mortality rates. While speculative, this interpretation is more consistent with other studies of inpatient mortality in VA during this period (e.g., Ashton et al. 2003), and the generally favorable trend of other quality indicators.

The coefficient on the control variable *WI* is negative and statistically significant in most cases. This result may reflect the tendency for the VHA's highly specialized, university-affiliated hospitals, which might be expected to have lower mortality, to be located in metropolitan areas, where the wage index is high. However, the negative estimated coefficients may also reflect differences in the patient populations residing in high and lower wage index areas.

The significantly negative association between the *CMI* and the mortality rate in column 1 of Table 6, Panel B initially seems counterintuitive, in that the negative coefficient on *CMI* suggests that more complex case mixes are associated with *lower* mortality rates. However, the *CMI* was designed primarily to predict cost not mortality (Iezzoni 2003). Within the VHA, most specialized procedures (e.g., coronary artery bypass surgery) are

---

[33] For example, patients once admitted solely to allow a procedure to be performed now might spend the night in a hospital ward, undergo the procedure in the morning, spend some time in an ambulatory recovery suite, and go home without ever being admitted. Only patients who had complications of the procedure would be admitted, increasing the mean severity of illness in the inpatient population.

[34] It is well known that a case mix index based on administrative data such as the CMI may not fully adjust for severity, particularly at the extremes of the distribution (Iezzoni 2003).

performed at large university-affiliated urban centers. These complex procedures tend to raise the *CMI*, but are relatively unlikely to be associated with short-term mortality. These hospitals will tend to have a high *CMI*, but low mortality. Conversely, patients with common, low complexity illnesses like pneumonia, which are associated with higher short-term mortality in the VHA's relatively older patient population, are admitted to both large and small hospitals. Thus, hospitals not providing complex tertiary procedures will have relatively low *CMI*, but may have an even higher mortality rate than hospitals providing such procedures. It is important to note that, although the *CMI* remains widely used in healthcare cost studies because of its availability and standardization, it is an imperfect measure of severity of illness. These limitations are particularly important in the VHA system, which includes both tertiary care hospitals performing procedures as complex as organ transplantation, and small primary hospitals that do not perform any operating room procedures.

In summary, the evidence on changes in the quality of healthcare services after the transformation is mixed, but with more indications of improvement than of service deterioration. For the six quality measures in Table 6 that are not included in NDPCs, two improved after the transformation, two remain unchanged, and two deteriorated. For the 14 cases in which improvement of indicators could be potentially observed in Table 5, all 14 improved.

Therefore, the overall evidence and analysis in this study indicate that the VHA reorganization yielded efficiency gains as evidenced by important reductions in the cost per patient without systematic quality degradation.[35] Cost reductions are positive and economically significant, and do not appear to be driven by changes in service mix.

Effects of Congressional Oversight on VHA costs

Another alternative explanation for our results is that the VHA cost per patient may have declined over our sample period primarily because Congress reduced the VHA medical care budget, rather than as a result of any changes in the VHA organizational architecture. Although mandated budget cuts clearly contributed to the reductions in the VHA's cost per patient in certain years, we next discuss why such cuts cannot explain most of the documented cost reductions.

First, if such a simple budget-cutting mechanism could improve efficiency without threatening the quality of care, Congress should have implemented such cuts prior to 1996. Second, the cuts mandated by Congress were not large enough to account for the documented reductions in cost per patient over the sample period. According to HEHS-96-191R (page 1), the Office of Management and Budget (OMB) imposed cuts of $385 million over 1995 and 1996 and Congress cut another $397 million in 1996. These cuts would reduce the annual cost per patient by $120, as compared to the combined 1995 and 1996 estimated cost reduction of $424 ($174 + $250) per patient from the VHA transformation (Model 1 of Table 3). Further, a large portion of the centrally mandated cuts involved overhead costs, which we exclude, and hence the congressionally mandated cuts would be smaller if measured on a comparable basis. Finally, the GAO notes that some facility integrations that are attributed to the congressional budget cuts were actually already in process under the VHA transformation. Hence, such cost reductions appear to be more appropriately attributed to the transformation than to congressional budget cutting. We also note that even the GAO questioned the feasibility of imposing effective across-the-board cuts, citing efficiency and quality concerns, which again suggests that imposed budget reductions are unlikely to account for the type of longer-term efficiency and quality improvements that we document.[36]

---

[35] Asch et al. (2004) also provide evidence that during the period 1997–2000 VHA patients received better quality care than did a national sample of non-VHA patients from 12 communities. The differences in quality were greater for those measures included in the VHA performance measurement system.

In addition to these first two arguments, we note more broadly that because the VHA is funded by congressional appropriations, it is ultimately very difficult to separate changes in VHA cost efficiency into congressional budget cuts versus internal VHA efficiencies. From this perspective, we believe that it is more informative to characterize the nature of congressional budgetary oversight during our sample period. Table 7 compares presidential budget requests for the VHA versus final congressional appropriations for the VHA for our 1992–1998 sample period. These data in Table 7 demonstrate that Congress typically did *not* cut the VHA budget below the amount in the President's budget request over this period. Specifically, for the seven years 1992–1998, the congressional appropriation to the VHA exceeded the amount in the President's budget for four years (1992, 1993, 1995, 1998), equaled the President's budget in 1997, and reduced the President's budget in 1994 and 1996. Further, the reduction in 1994 was relatively small (0.13 percent), and the larger budget cut in 1996 reflected extraordinary circumstances of a temporary shut down of the federal government resulting from the budget dispute between President Clinton and Congress.

The preceding description is consistent with Congress generally acting to protect the status quo, maintain the support of the veterans' lobby, and preserve or increase spending in the districts of committee members (Schick 2000, 209–211). Hence, although Congress did ultimately implement specific cuts in the VHA budget in the 1996 budget showdown,

TABLE 7
VHA Presidential Budget Requests and Congressional Appropriations

Fiscal Year	Presidential Budget Request[a]	Actual Appropriation
1992	$13,287,096,000 (President's Budget FY1992)	$13,512,920,000 (Public Law 102-139)
1993	$14,631,920,000 (President's Budget FY1993)	$14,642,723,000 (Public Law 102-389)
1994	$15,642,452,000 (President's Budget FY1994)	$15,622,452,000 (Public Law 103-124)
1995	$16,121,756,000 (President's Budget FY1995)	$16,232,756,000 (Public Law 103-327)
1996	$16,961,487,000 (President's Budget FY1996)	$16,564,000,000 (Public Law 104-134)
1997	$17,008,447,000 (President's Budget FY1997)	$17,008,447,000 (Public Law 104-204)
1998	$16,958,846,000 (President's Budget FY1998)	$17,057,396,000 (Public Law 105-65)

[a] The President's budget amount is excerpted from Veterans Health Administration Federal Funds in the Detailed Budget Estimate by Agency in the President's Budget for that fiscal year. The amount is shown on line number 89.00 Budget Authority (net) and it does not include any indefinite special fund requests.

---

[36] The GAO describes across-the-board cuts that were applied to all VHA facilities in 1995 and 1996 (GAO 1996b, 6). The GAO expressed reservations, noting that, "VA cut facilities' budget allocations across the board. Our work suggests that this approach to cost cutting will not allow VA to achieve cost efficiencies nor will it ensure that patient care will be maintained" (GAO 1996b, 2 and 6–7).

the more general process of VHA transformation and efficiency improvements proceeded with quiet support from Congress, particularly key congressional committees, rather than from Congress driving the changes.

VI. CONCLUSION

There is little empirical evidence on the effect of the implementation of innovative management techniques in the public sector (Ittner and Larcker 1998). Therefore, the efficiency improvements documented in this study represent new evidence that supports the theoretical proposition that coordinating and adapting organizational changes to align with strategic goals can move public sector organizations toward targeted metrics. Our results suggest that one explanation for the general ineffectiveness of previous government reforms was the failure to make *coordinated* changes in the entire organizational architecture (Ittner and Larcker 1998; Downs and Larkey 1986; Wildavsky 1984).

These results are similar to those found in studies of private sector OA changes by Baker and Wruck (1989), Wruck and Jensen (1994), and Treml and Lehn (2000). Our results suggest that even in the absence of capital markets feedback and with the additional transactions costs involved in restructuring large bureaucracies, coordinating decision rights, performance measurement, and reward systems with organizational structure and strategy in public sector organizations can result in value creation. Our empirical findings that a bureaucracy can adapt its organizational architecture (OA) in response to external pressure and thereby create efficiency gains is also consistent with Cavalluzzo et al. (1998), who document efficiency gains in response to competition. Finally, documenting the success of the VHA, a large bureaucracy targeted for its perceived lack of quality and efficiency, demonstrates the potential for significant improvements in efficiency when the government is committed to reform and changes in performance measures and incentives are coordinated with changes in organizational structure and strategy.

It is important to acknowledge that the VHA transformation did not occur in a vacuum. Hence, a variety of factors besides the changes in the VHA OA are also likely to have influenced the documented improvement in VHA efficiency. Nevertheless, as described earlier in the paper, our analysis suggests that the documented efficiency improvements in the VHA following the 1996 VHA reorganization cannot be largely explained by a shift to low-cost patients, a reduction in the quality of patient care, or congressional budget cutting.

In summary, although forces besides the VHA reorganization undoubtedly contributed to the observed VHA cost reductions, we believe that the VHA organizational transformation is the most reasonable explanation for the majority of the observed results.

One potential extension of this study would examine differential control system changes across the 22 VHA networks of hospitals. In particular, network managers had discretion with respect to the detailed strategies that they implemented. Analyzing how variations in such techniques are related to differential efficiency effects may provide additional insight into the process of organizational change in a governmental bureaucracy.

Second, it would be useful to have a more complete analysis of the service mix shift over time that resulted from incentives created by the reorganization. This would improve our understanding of the effect of the reorganization on the cost to care for regular- and complex-care patients as opposed to low-cost patients. To the extent that the VHA does not serve low-cost patients at the expense of priority veterans, adding this clientele to the product mix is likely to be valuable. This may be the case if the VHA is using excess capacity to treat low-cost patients and if the quality of care provided to priority veterans remains unchanged or improves.

APPENDIX
Extract from Sample Network Director Performance Contract
(based on the 1997 Network Director Performance Contract [DVA 1997d])

Introduction

The 1997 Network Director's Performance Plans consist of Parts A, B, and C. Part A describes network executive core competencies. Part B highlights areas of organizational special concern, and Part C defines quantifiable network performance on a set of measures deemed critical to organizational success.

Evaluation of Part A

The core competencies are: interpersonal effectiveness, customer service, systems thinking, flexibility/adaptability, creative thinking, organizational stewardship, personal mastery, and technical competency. At the end of the rating period, Directors will be asked to briefly describe an action/accomplishment that reflects each of these competencies.

Evaluation of Part B

The areas of organizational special concern are: safety, risk management, credentialing and privileging, and fairness of workforce treatment. At the end of the rating period, Directors will be asked to briefly describe an action/accomplishment that reflects each of these competencies.

Evaluation of Part C (Incentive Measures)

The performance measures are categorized by the mission goal they support. Within the mission goal of delivering health care value, the measures are further subdivided by domain of value. Each individual measure is equally weighted to maintain maximum network flexibility and to encourage strategic network system thinking.

Domain	Measures
Cost	Bed days of care, total operating beds, percentage of ambulatory surgery
Access	Total Category A patients, timeliness of access (customer satisfaction survey problems)
Technical quality	Primary care enrollment, compensation and pension requests, chronic disease index (CDI), prevention index (PI), palliative care
Veteran satisfaction	Customer service standards survey score, percentage of satisfied spinal cord injury patients from customer satisfaction survey
Functional status	Addiction severity index

Summary Rating

Part A and Part B parameters must be met to support an overall rating of at least Fully Successful. Part C is a critical element. The following describes how Parts A, B, and C contribute to the summary rating:

Parts A and B	Part C	Summary Rating
Exceptional	Exceptional	Outstanding
Fully Successful	Exceptional	Excellent
Exceptional	Fully Successful	Fully Successful
Fully Successful	Fully Successful	Fully Successful
Less than Fully Successful	Fully Successful	Minimally Satisfactory
Fully Successful	Less than Fully Successful	Unsatisfactory

REFERENCES

Alchian, A. A. 1965. *Some Economics of Property Rights.* Mimeograph. General meeting of the Mont Pelerin Society, Stresa, Italy.

Arnold, P. E. 1974. Reorganization and politics: A reflection on the adequacy of administrative theory. *Public Administration Review* 34 (May/June): 205–211.

———. 1976. The First Hoover Commission and the Managerial Presidency. *The Journal of Politics* 38 (1): 46–70.

Asch, S. M., E. McGlynn, M. Hogan, R. Hayward, P. Shelkelle, L. Rubenstein, J. Keesey, J. Adams, and E. Kerr. 2004. Comparison of quality of care for patients in the Veterans Health Administration and patients in a national sample. *Annals of Internal Medicine* 141 (12): 938–945.

Ashton, C. M., J. Souchek, N. J. Petersen, T. J. Menke, T. C. Collins, K. W. Kizer, S. M. Wright, and N. P. Wray. 2003. Hospital use and survival among Veterans Affairs beneficiaries. *The New England Journal of Medicine* 349 (17): 1637–1646.

Atkinson, A. A., and J. Q. McCrindell. 1997. Strategic performance measurement in government. *Cost and Management:* 20–23.

Baker, G., and K. Wruck. 1989. Organizational changes and value creation in leveraged buyouts: The case of O. M. Scott and Sons Company. *Journal of Financial Economics* 25: 163–190.

Banker, R. D., G. Potter, and D. Srinivasan. 2000. An empirical investigation of an incentive plan that includes nonfinancial performance measures. *The Accounting Review* 75 (1): 65–92.

Biro, L. A., M. E. Moreland, and D. E. Cowgill. 2003. Achieving excellence in veterans healthcare—A balanced scorecard approach. *Journal for Healthcare Quality* 25 (3).

Brickley, J., C. Smith, and J. L. Zimmerman. 1995. The economics of organizational architecture. *Journal of Applied Corporate Finance* 8 (2): 19–31.

———, ———, and ———. 1996. *Organizational Architecture: A Managerial Economics Approach.* Chicago, IL: Irwin.

———, ———, and ———. 1997. Management fads and organizational architecture. *Journal of Applied Corporate Finance* 10 (2).

Carey, K. A. 1997. A panel data design for estimation of hospital cost functions. *The Review of Economics and Statistics* 79: 443–453.

Cavalluzzo, K. S., C. D. Ittner, and D. F. Larcker. 1998. Competition, efficiency, and cost allocation in government agencies: Evidence on the Federal Reserve System. *Journal of Accounting Research* 36 (1): 1–32.

———, and ———. 2004. Implementing performance measurement innovations: Evidence from government. *Accounting, Organizations and Society* (29): 243–267.

Caves, D. W., and L. R. Christensen. 1980. The relative efficiency of public and private firms in a competitive environment: The case of Canadian railroads. *Journal of Political Economy* 88 (5): 958–976.

Center for Health Services and Policy Research (CHSPR). 1991. *Analysis of the Organizational Structure and Management Functioning of the VA's Health Delivery System.* Washington, D.C.: Department of Veterans Affairs.

Charns, M. P., W. H. Wubbenhorst, and V. A. Parker. 1997. VISN service line implementation: Who's doing what? *Transition Watch* 1 (2): 1–8.

Commission on the Future Structure of Veterans Health Care (CFSVHC). 1991. *Proceedings of the Commission on the Future Structure of Veterans Health Care.* Meeting June 19–20, 1990, Washington, D.C. Washington, D.C.: Department of Veterans Affairs.

Connor, R. A., R. D. Feldman, and B. E. Dowd. 1998. The effects of market concentration and horizontal mergers on hospital costs and prices. *International Journal of the Economics of Business* 5 (2): 159–180.

Davies, D. G. 1971. The efficiency of public versus private firms: The case of Australia's two airlines. *Journal of Law and Economics* 14 (April): 149–165.

Demers, E., M. Shackell, and S. K. Widener. 2002. Complementarities in organizational design: Empirical evidence from the new economy. Simon School of Business Working Paper No. FR 03-01. Available at: http://ssrn.com/abstract=357822.

Demsetz, H., and K. Lehn. 1985. The structure of corporate ownership: Causes and consequences. *Journal of Political Economy* 93: 1155–1177.

Department of Veterans Affairs (DVA). 1992a. *Blueprint for Quality: A Solid Foundation; A Platform for Care.* Volume I. Office of Quality Management. Washington, D.C.: Veterans Health Administration.

———. 1992b. *Blueprint for Quality: A Solid Foundation; A Platform for Care.* Volume II. Office of Quality Management. Washington, D.C.: Veterans Health Administration.

———. 1996. *1996 Network Director Performance Plan.* Office of Performance and Quality; Office of Performance Management. Washington, D.C.: Veterans Health Administration.

———. 1997a. *Draft: Strategic Plan FY1998–2003.* Office of Policy, Planning and Performance. Washington, D.C.: Veterans Health Administration.

———. 1997b. *Journey of Change: Annual Report and Strategic Forecast.* Washington, D.C.: Veterans Health Administration.

———. 1997c. *Veterans Equitable Resource Allocation System 1996.* Washington, D.C.: Veterans Health Administration.

———. 1997d. *1997 Network Director Performance Plan.* Office of Performance and Quality; The Office of Performance Management. Washington, D.C.: Veterans Health Administration.

———. 1998a. *1998 Network Director Performance Plan.* Office of Performance and Quality; The Office of Performance Management. Washington, D.C.: Veterans Health Administration.

———. 1998b. *A Guidebook for VHA Medical Facility Integration.* Washington, D.C.: Veterans Health Administration.

———. 2000. V*eterans Equitable Resource Allocation.* Washington, D.C.: Veterans Health Administration.

———. 2003. V*eterans Equitable Resource Allocation.* 7th edition. Washington, D.C.: Veterans Health Administration.

Dirsmith, M. W., S. F. Jablonsky, and A. D. Luzi. 1980. Planning and control in the U.S. federal government: A critical analysis of PPB, MBO and ZBB. *Strategic Management Journal* 1: 303–329.

Downs, G. W., and P. D. Larkey. 1986. *The Search for Government Efficiency: From Hubris to Helplessness.* Philadelphia, PA: Temple University Press.

Dranove, D. 1998. Economies of scale in non-revenue producing cost centers: Implications for hospital mergers. *Journal of Health Economics* 17: 69–83.

Farber, S. J., National Academy of Sciences, and the National Research Council. 1977. *Study of Health Care for American Veterans: A Report Submitted to the Committee on Veterans' Affairs.* Washington, D.C.: Government Printing Office.

Feltham, G., and J. Xie. 1994. Performance measure congruity and diversity in multi-task principal/agent relations. *The Accounting Review* 69: 429–453.

Garthwaite, T. L. 2000. Profiles in leadership: Dr. Thomas L. Garthwaite, Under Secretary for Health Veterans Health Administration, Department of Veterans Affairs. *The Price Waterhouse Endowment for the Business of Government* (Fall): 28–31.

Grossman, S., and O. Hart. 1980. Takeover bids, the free-rider problem, and the theory of the corporation. *Bell Journal of Economics* 11: 42–64.

Green, W. H. 1994. *Econometric Analysis.* New York, NY: Macmillan.

Hayek, F. A. 1945. The use of knowledge in society. *American Economic Review* 35 (September): 1–18.

Hollingsworth, J. W., and P. K. Bondy. 1990. The role of Veterans Affairs hospitals in the health care system. *The New England Journal of Medicine* 322 (26): 1851–1857.

Hood, C. 1995. The "New Public Management" in the 1980s: Variations on a theme. *Accounting, Organizations and Society* 20: 93–109.

Iezzoni, L. I. 2003. *Risk Adjustment for Measuring Healthcare Outcomes.* 3rd edition. Chicago, IL: Health Administration Press.

Iglehart, J. K. 1985. The Veterans Administration medical care system and the private sector. *The New England Journal of Medicine* 313 (24): 1552–1556.

———. 1996. Reform of the Veterans Affairs health care system. *The New England Journal of Medicine* 335 (18): 1407–1412.

Ittner, C. D., and D. F. Larcker.1995. Total quality management and the choice of information and reward systems. *Journal of Accounting Research* 33 (Supplement): 1–34.

———, and ———.1998. Innovations in performance measurement: Trends and research implications. *Journal of Management Accounting Research* 10: 205–238.

———, and ———. 2001. Assessing empirical research in managerial accounting: A value-based management perspective. *Journal of Accounting and Economics* 32 (1–3): 349–410.

Jensen, M. C., and W. H. Meckling. 1976. Theory of the firm: Management behavior, agency costs and ownership structure. *Journal of Financial Economics* 3: 305–360.

———. 1983. Organization theory and methodology. *The Accounting Review* 58 (2): 319–349.

———, and W. H. Meckling. 1992. Specific and general knowledge and organizational structure. In *Contract Economics.* edited by L. Werin and H. Wijkander. Oxford, U.K.: Blackwell Ltd.

———. 1993. The modern industrial revolution, exit, and the failure of internal control systems. *The Journal of Finance* (July).

Jha, A. K., J. B. Perlin, K. W. Kizer, and R. A. Dudley. 2003. Effect of the transformation of the Veterans Affairs Health Care system on the quality of care. *The New England Journal of Medicine* 348 (May 29): 2218–2227.

Kizer, K. W. 1995. *Vision for Change—A Plan to Restructure the Veterans Health Administration.* Washington, D.C.: Veterans Health Administration.

———. 1996. *Prescription for Change: The Guiding Principles and Strategic Objectives Underlying the Transformation of the Veterans Healthcare System.* Washington, D.C.: Veterans Health Administration.

———. 1997. *Forward to Veterans Equitable Resource Allocation System 1996.* Washington, D.C.: Veterans Health Administration.

———, M. L. Fonseca, and L. M. Long. 1997. The veterans healthcare system: Preparing for the twenty-first century. *Hospital & Health Services Administration* 42 (3): 283–298.

———. 1999. The "New VA": A national laboratory for health care quality management. *American Journal of Medical Quality* 14: 3–20.

Kole, S. R., and K. Lehn. 1999. Deregulation and the adaptation of governance structure: The case of the U.S. airline industry. *Journal of Financial Economics* 52 (1): 79–117.

Liang, K., and S. L. Zeger. 1986. Longitudinal data analysis using generalized linear models. *Biometrika* 73: 13–22.

Light, P. C. 1997. *The Tides of Reform: Making Government Work, 1945–1995.* Binghamton, NY: Vail-Ballou Press.

Lindsay, C. M. 1975. *Veterans Administration Hospitals: An Economic Analysis of Government Enterprise.* Washington, D.C.: American Enterprise Institute for Public Policy Research.

Lukas, C. V., B. Mittman, J. Hernandez, J. D. Macdonald, E. Yano, and B. Simon. 1998. *Analysis of Facility Integrations.* Health Services Research and Development Service, Office of Research and Development, Department of Veterans Affairs. Washington, D.C.: Veterans Health Administration.

Management Science Group (MSG). 1993. *A Comparison of the Operating Costs and Performance of VA and Non-Federal Hospitals: 1984–1992.* Department of Veterans Affairs. Washington, D.C.: Veterans Health Administration.

———. 1996. *Overview of a Comparison of the Operating Costs and Performance of VA and Non-federal Hospitals: 1984–1992.* October. Washington, D.C.: Veterans Health Administration.

———. 2001. *VA Capitated Patient Cost Analysis. Veterans Health Administration.* Department of Veterans Affairs. Available at: http://world.std.com/~mgtsci/projects/capitation.html.

March, J. G., and J. P. Olson. 1983. Organizing political life: What administrative reorganization tells us about government. *The American Political Science Review* 77 (2): 281–296.

Milgrom, P., and J. Roberts. 1992. *Economics, Organization and Management.* Englewood Cliffs, NJ: Prentice Hall.

Minority Staff of the Committee on Veterans' Affairs. 1997. *Staff Report on Quality Management in the Veterans Health Administration Department of Veterans Affairs.* Washington, D.C.: Veterans Health Administration.

Moe, T. M. 1990. Political institutions: The neglected side of the story. *Journal of Law, Economics, and Organization* 6 (Special Issue): 213–266.

Nagar, V. 2002. Organizational design choices in retail banking. *The Accounting Review* 77 (2): 379–395.

National Performance Review. 1993. *Creating a Government that Works Better and Costs Less.* Washington, D.C.: Government Printing Office.

Perlin, J. B., R. M. Kolödner, and R. H. Roswell. 2004. The Veterans Health Administration: Quality, value, accountability, and information as transforming strategies for patient-centered care. *The American Journal of Managed Care* 10 (Part 2): 828–836.

———. 2006. Transformation of the U.S. Veterans Health Administration. *Health Economics, Policy and Law* 1: 99–105.

Savas, E. S., ed. 1977. *Alternatives for Delivering Public Services: Toward Improved Performance. Westview Special Studies in Public Systems Management.* Boulder, CO: Westview Press.

Schick, A. 2000. *The Federal Budget: Politics, Policy, Process.* Washington, D.C.: Brookings Institution Press.

Thibodeau, N. 2003. Improving the organizational architecture of public enterprise: An investigation of the effect of the federal government's latest effort through the Veterans Health Administration. Doctoral dissertation, University of Pittsburgh.

Treml, H. E., and K. Lehn. 2000. Decentralization, incentives, and value creation: The case of JLG Industries. *The Journal of Applied Corporate Finance* Fall: (3).

Trevelyan, E. 2002. The performance management system of the Veterans Healthcare Administration. Harvard School of Public Health Case Study, Boston, MA.

U.S. Executive. 1912–14. *Reports of the President's Commission on Economy and Efficiency: Correspondence with Public Accountants.* National Archives Manuscript Division, RG 51, Sec. 311. Washington, D.C.: Government Printing Office.

United States General Accounting Office (GAO). 1993. *Government Performance and Results Act of 1993.* Washington, D.C.: Government Printing Office.

———. 1996a. *VA Health Care: Substance Abuse Treatment Programs Serve Psychologically and Economically Disadvantaged Veterans.* Report No. GAO/HEHS-96-204. Washington, D.C.: Government Printing Office.

———. 1996b. *VHA's Management Improvement Initiative.* Health, Education and Human Services Division (B-271514), Report No. GAO/HEHS-96-191R. Washington, D.C.: Government Printing Office.

———. 1997a. *Performance Budgeting: Past Initiatives Offer Insights for GPRA Implementation.* Report No. AIMD-97-46. Washington, D.C.: Government Printing Office.

———. 1997b. *Assessment of VA's Fiscal Year 1998 Budget Proposal.* Report No. GAO/T-HEHS-97-121. Washington, D.C.: Government Printing Office.

Wasserman, J., J. S. Ringel, B. O. Wynn, J. Zwanziger, K. Ricci, S. Newberry, B. Genovese, and M. Schoenbaum. 2001. An analysis of the Veterans Equitable Resource Allocation (VERA) system.

In *The Cost of Academic Affiliations Under Vera.* Washington, D.C.: Government Printing Office.

Weisentstein, E. 1991. House panel finds 30 VA hospitals deficient. *Modern Health Care* 21 (14).

Wildavsky, A. 1984. *The Politics of the Budgetary Process.* Boston, MA: Little, Brown and Company.

Wruck, K. H., and M. C. Jensen. 1994. Science, specific knowledge, and total quality management. *Journal of Accounting and Economics* 18: 247–287.

———. 2000. Compensation, incentives and organizational change: Ideas and evidence from theory and practice. Working paper, The Ohio State University.

Yaisawarng, S., and J. F. Burgess, Jr. 2006. Performance-based budgeting in the public sector: An illustration from VA Health Care System. *Health Economics* 15 (15): 295–310.

Young, G. J. 2000. Transforming government: The revitalization of the Veterans Health Administration. *Presidential Transitional Series—The Price Waterhouse Endowment for the Business of Government.* June.

THE ACCOUNTING REVIEW
Vol. 82, No. 2
2007
pp. 521–543

Investors' Reactions to Management Guidance Forms: The Influence of Multiple Benchmarks

Jun Han
University of Hong Kong

Hun-Tong Tan
Nanyang Technological University

ABSTRACT: In this study, we investigate underlying mechanisms for the effects of management guidance forms on investors' judgments. We do so by comparing effects of point and range guidance with those associated with a hybrid management guidance form that combines the attributes of both point and range guidance. With respect to investors' earnings reestimates made after actual earnings announcements, we find that both the number and type of benchmarks associated with the guidance forms matter. High-knowledge investors use both primary (explicitly stated) and secondary (implicitly stated) benchmarks, whereas low-knowledge investors attend only to primary benchmarks. We also find that investors have greater confidence in their earnings estimates when management guidance explicitly provides best estimates.

Keywords: *management guidance; guidance form; investor knowledge; multiple reference points.*

Data Availability: *Please contact the authors.*

I. INTRODUCTION

The issuance of management earnings guidance has become increasingly popular among listed companies, and is an area that has attracted growing research interest (Healy and Palepu 2001; Kothari 2001).[1] Thus far, research documents five forms of guidance generally issued by management: point, range, minimum, maximum, and qualitative (Baginski et al. 1993; Pownall et al. 1993; Baginski and Hassell 1997; Soffer et al. 2000).

---

[1] The term "preannouncement" has also been used in prior research (Soffer et al. 2000; Tan et al. 2002).

We thank Amit Das, Eric Hirst, Khim Kelly, Bob Libby, Marlys Lipe (editor), Terence Ng, Mui Siang Tan, two anonymous referees, and workshop participants at Nanyang Technological University, University of Alberta, University of Hong Kong, and University of Western Australia for helpful comments. We appreciate the research assistance of Renhui Fu, Thi-Thu Vo, and Ting Yang.

Editor's note: This paper was accepted by Marlys Lipe.

Submitted December 2005
Accepted July 2006

Prior research has focused on point and range guidance, and documented judgment effects associated with each. For example, Libby et al. (2006) show that when actual earnings fall short of a point guidance form but fall within the limits of a range guidance form, analysts' EPS reestimates are higher in the case of range guidance than for point guidance.[2] This suggests a benefit to management issuing range guidance, and may account for the fact that range guidance comprises the majority of management guidance issued (Cotter et al. 2006). However, there is a potential cost of issuing range guidance as opposed to the more precise point guidance. Investors and analysts are less confident in their own stock price predictions and earnings estimates made immediately following range guidance than point guidance (Hirst et al. 1999; Libby et al. 2006). Lower confidence associated with range guidance suggests a cost to management in that it may affect investors' and analysts' attitude toward management to the extent that they prefer to have less uncertainty in making judgments that could have financial consequences. Investors' confidence is also associated with investment decisions (Barber and Odean 2001).

Two features distinguish point guidance from range guidance: presence of an explicit best estimate in the case of point guidance (with the midpoint only implicitly indicated in range guidance), and presence of lower and upper limits in the case of range guidance (but not in the case of point guidance). However, prior research does not adequately consider both features in providing explanations for judgment effects of point versus range guidance.

For example, Libby et al. (2006) suggest that the difference in the *number* of benchmarks inherent in point versus range guidance is a possible mechanism that accounts for guidance form effects in analysts' earnings reestimates.[3] Libby et al. (2006) suggest that when actual earnings miss (exceed) the two benchmarks in range guidance, investors' reactions are more negative (positive) than when actual earnings miss (exceed) the single benchmark in point guidance. They do not consider or test the possibility that the *type* of benchmarks (i.e., whether these benchmarks are primary or secondary) matters in assessing the effects of different guidance forms. We introduce and test the validity of the multiple-reference-points theory from psychology in explaining the effect of guidance forms on earnings reestimates. Specifically, this theory suggests that judgment effects of exceeding or missing a benchmark are greater for a primary (explicitly mentioned) benchmark than for a secondary (implicitly mentioned) benchmark, with effects magnified when all benchmarks are consistent in sign, and dampened otherwise (e.g., see Gregory et al. 1993; Boles and Messick 1995). We further refine this multiple-reference-points theory and extend psychology research by specifying that the predictions of this theory are contingent on investors' knowledge of different guidance forms (e.g., point versus range guidance) and their effects, and apply when investors have this knowledge, but not otherwise.

---

[2] In the present study, "guidance" refers to management's expectations of future earnings, and "estimates" refer to investors' expectations of future earnings. Here, investors' earnings estimates are investors' expectations after management guidance, and investors' earnings reestimates are their new expectations after actual earnings announcements.

[3] Libby et al. (2006) distinguish between a benchmark mechanism and a range precision mechanism. Their findings indicate that the benchmark and range precision mechanisms lead to identical predictions when the comparisons involve point guidance and narrow range guidance. However, the range precision mechanism better explains their findings when comparisons involve wide versus narrow range guidance. Because our study involves narrow range guidance and a hybrid guidance form that also has a narrow width (and not comparisons between range guidance of varying widths), the basic benchmark mechanism likely applies. Also, as the name "range precision" suggests, the range precision mechanism is more applicable for comparisons involving ranges of different widths, which is not the focus of our study. The multiple-reference-points theory used here is a somewhat richer version of the benchmark mechanism described in Libby et al. (2006) in that it distinguishes between primary and secondary benchmarks. In our paper, "reference point" and "benchmark" are used interchangeably.

In this study, we identify and assess the validity of mechanisms responsible for earnings reestimates and confidence effects of guidance forms by comparing effects of point and range guidance with those associated with a hybrid management guidance form that combines the attributes of both point and range guidance. As an illustration, consider the following hybrid guidance issued by RailAmerica, Inc., a company listed on NYSE, in its second quarter financial-year 2005 earnings conference call:

> [W]e now anticipate our 2005 earnings-per-share to be $0.93 plus or minus $0.03. (FD [Fair Disclosure] Wire, July 28, 2005)

The earnings guidance cited above does not clearly belong to any one of the five guidance forms described earlier. It jointly specifies both management's best estimate and the possible variations from the best estimate. In this sense, it can be viewed as a hybrid of point and range guidance (hereafter, we label it as MID guidance) in that it provides both a best estimate (as in point guidance) and a range (as in range guidance). Such a hybrid guidance form is important not only because it allows us to test for underlying explanations for the effects of point versus range guidance, but also because this guidance form is increasingly popular (see Section II). Furthermore, when we traced samples of MID guidance to the FirstCall database, we found that MID earnings guidance is coded either as point or range guidance, but not in its original form. Thus, existing databases such as FirstCall do not separately code MID guidance, appear to assume that MID guidance is either point or range guidance, and also assume that its properties are indistinguishable from those of point or range guidance. Due to the recency of issuing MID guidance, little is known about the properties of such guidance.

We investigate these issues in an experimental setting. A laboratory experiment is particularly appropriate in the context of our research question. The frequency of MID guidance, although increasing, is currently not large enough to enable analysis of archival data. In fact, as we discussed earlier, archival data recorded in the FirstCall database is not reliably or accurately coded. An experiment also allows better control of extraneous effects (e.g., actual earnings announcements or revenue guidance contemporaneously announced) associated with earnings guidance, and self-selection issues.

In our experiment, M.B.A. students are given EPS management guidance issued either in point, range, or MID form. We set the midpoints of the range and MID guidance to be equal to the best estimate in the point guidance, and hold the limits of the range and MID guidance constant. We keep the range width at 4 cents, which is reflective of the typical range-width issued by management. We provide the first evidence on the effects of guidance form in a context where actual earnings fall below the best estimate of the point guidance, but *within* the lower limits of the range and MID guidance (hereafter, for simplicity, we refer to this situation as one in which actual earnings fall "in the lower end").[4] We examine this context where actual earnings fall within the limits of range (and MID) guidance issued by management because prior research indicates a high proportion of firms that meet analysts' expectations (Degeorge et al. 1999; Brown 2001)—this implies that management is likely to issue guidance such that actual earnings fall within a range, rather than fall below its lower endpoint.

---

[4] Libby et al. (2006) note that the median and mean widths of range guidance are 3 and 5 cents, respectively. They also note that few range guidance examples have widths in excess of 10 cents (and their wide range condition has a width of 12 cents). In their narrow range guidance condition, actual earnings are always manipulated to fall outside (not within) the range limits.

We also provide evidence on whether the effects of guidance form vary by investors' knowledge. There is currently no empirical evidence on this issue, even though regulators are generally concerned about the interests of less-knowledgeable market players (Maines and McDaniel 2000). Results of our experiment involving M.B.A. students are as follows. In terms of investors' earnings reestimates, we find that reestimates for high-knowledge participants (as well as for all participants) are highest in the range condition, followed by the MID condition, then by the point condition. Low-knowledge participants do not treat the MID guidance as a hybrid guidance form, but more like a point guidance form. Their reestimates in the point and MID conditions are similar, and both are lower than those in the range condition. These results are consistent with high-knowledge participants paying differential attention to benchmarks that are explicitly *and* implicitly associated with different guidance forms (and not only to explicit or primary benchmarks; cf. Libby et al. 2006), and with low-knowledge participants paying attention only to explicitly stated benchmarks related to these guidance forms.

In additional analyses, we investigate the mechanisms responsible for confidence effects found in prior studies, which document that investors/analysts have lower confidence in their initial stock price/earnings predictions made immediately after the issuance of range guidance compared to point guidance (Hirst et al. 1999; Libby et al. 2006). Hirst et al. (1999) suggest that this is due to the greater uncertainty when lower and upper limits of a range guidance form are provided. They test neither this explanation nor an alternative explanation that the presence of an explicit best estimate in the case of point (versus range) guidance is responsible for the confidence effects of guidance form. We find that high-knowledge participants' confidence in their earnings estimates given the MID guidance is not different from that associated with the point guidance (both of which explicitly state a best estimate), and confidence for both guidance forms is higher than that associated with the range guidance (which does not explicitly state a best estimate). This result is consistent with the argument that the provision of a "best estimate" increases high-knowledge investors' confidence, and inconsistent with the argument that the provision of range limits decreases their confidence. We also compare these confidence effects with those associated with another hybrid guidance form, the "midpoint + range" guidance, which is not presently used in practice and takes the form "Earnings per share will be about $X, varying from $Y to $Z." This comparison provides further evidence that it is the provision of a best estimate and not the provision of half the range-width (in the case of MID guidance) that leads to these effects. Low-knowledge investors' confidence is not influenced by guidance form.

The rest of the paper is structured as follows. Section II develops the research hypotheses. Section III describes the experiment. We describe the findings in Section IV, and discuss limitations and areas for future research in Section V.

II. BACKGROUND AND HYPOTHESIS DEVELOPMENT

Early research using archival data documents mixed effects of guidance form on market reactions. For example, Baginski et al. (1993) find that the more precise point guidance is associated with stronger stock market reaction compared to range guidance, while Pownall et al. (1993) find no effects of guidance form. More recent evidence on the effects of point and range guidance using experimental settings indicates that guidance form does not influence initial stock price predictions/earnings estimates made immediately after the issuance of management guidance (Hirst et al. 1999; Libby et al. 2006). However, guidance form influences earnings reestimates made after the announcement of actual earnings in that earnings reestimates are higher (lower) when actual earnings exceed (miss) the point guidance or range mean, with the effect magnified for narrow range guidance relative to point guidance; effects are smaller for wide range guidance relative to point guidance (Libby et al. 2006). Our focus in this paper is on narrow rather than wide range guidance because wide range guidance is not common (see footnote 4).

Libby et al. (2006) discuss a benchmark model where actual earnings are assessed relative to the benchmarks associated with each management guidance form. The effects of benchmarks have been examined by prior accounting studies. Zero, prior EPS, and the consensus analysts' forecast are benchmarks that are the targets of earnings management, and benchmarks against which investors compare current EPS (Degeorge et al. 1999). Several accounting studies show that investors are influenced by managers' attempts to manipulate benchmarks used to assess current period's earnings performance (Schrand and Walther 2000; Bowen et al. 2005; Krische 2005).

The benchmark model by Libby et al. (2006) only recognizes explicitly mentioned benchmarks (best estimate for point guidance, endpoints for range guidance), and their comparison of point versus range guidance precludes them from directly assessing the effects of implicitly mentioned benchmarks. Point and range guidance differ in more than one attribute, so it is impossible to isolate the specific characteristics of point and range guidance leading to these judgment differences by comparing effects of point and range guidance. Specifically, point guidance provides an explicit best estimate, whereas range guidance differs from point guidance in two major aspects: provision of both explicit lower and upper limits, as well as an implicit best estimate (in terms of the midpoint of the range). In short, without comparison with an alternative guidance form that contains a midpoint and lower/upper limits (like the range guidance) but that also varies in terms of whether these are explicitly or implicitly mentioned, there are limits in making inferences on the mechanisms responsible for the effects of guidance forms.

The MID guidance form we investigate in this paper contains these attributes in that the best estimate is explicitly stated with the endpoints implicitly stated. It can be viewed as a hybrid guidance form combining attributes of both point and range guidance. Comparison of this MID form with point and range guidance enables us to assess the effects of primary (explicitly mentioned) benchmarks and secondary (implicitly mentioned) benchmarks. In addition, this MID guidance form is of interest because it has been increasingly issued by firms in recent years. To assess the popularity of the MID guidance, we hand-collected a sample of MID management earnings guidance issued between January 1, 2002 and December 31, 2005 using the Factiva database. In year 2001, we found only six instances of MID quarterly guidance. For years 2002 to 2005, the annual frequency varied between 19 and 32. In total, we identified 100 instances of MID quarterly earnings guidance over this period. By way of comparison, Cotter et al. (2006) indicate an average of 455 instances of quarterly earnings guidance each year between years 1998 and 2001, of which 21.8 percent (99) and 51.0 percent (232) are point and range guidance, respectively.[5]

Multiple-Reference-Points Theory

We employ the multiple-reference-points theory from psychology to develop broad principles to make predictions about the effects of various guidance forms on investors' earnings reestimates given actual earnings announced by management (Gregory et al. 1993;

---

[5] In addition to quarterly earnings guidance, we also identified 62 instances of MID annual earnings guidance issued during the five-year period. Cotter et al. (2006) report 1819 instances of quarterly earnings guidance over the four-year period between years 1998 and 2001, implying an average of 455 instances per year. Cotter et al. (2006) impose restrictive criteria in their sample selection. Hence, the number of instances of management guidance they report is likely to be understated.

Boles and Messick 1995; Sullivan and Kida 1995; Blount et al. 1996). The first principle derived from this theory is that benchmarks that are explicitly mentioned serve as primary benchmarks (and are weighted more by investors), and benchmarks that are not explicitly mentioned are secondary (and weighted less; Boles and Messick 1995, Blount et al. 1996). The second principle is that the sign associated with the benchmark—whether the benchmark is exceeded (positive) or missed (negative)—matters, implying that the judgment effect of exceeding (missing) a benchmark is positive (negative) (e.g., Boles and Messick 1995). Along with these two principles, our analysis also utilizes two assumptions commonly made in the literature. One assumption is that benchmarks are separately evaluated. This implies that investors compare actual earnings performance against each benchmark and then integrate the overall judgment implications, rather than set off all benchmarks into one single benchmark and then evaluate the actual earnings against this single benchmark (Ordonez et al. 2000). Another assumption is that investors use a simple counting mechanism where they count the number of benchmarks of a similar type (primary or secondary) that is exceeded or missed. This is consistent with prior research on the use of benchmarks in evaluating earnings (Libby et al. 2006), research that suggests that numerical data are encoded by their evaluative implications (Kida and Smith 1995; Kida et al. 1998), and research that suggests that decision makers' final evaluations are determined by the frequency (not intensity) of positive versus negative events (Diener et al. 1991).

One issue unique to a multiple-reference-points setting (in contrast to a single-reference-point setting) relates to reference point conflict (Boles and Messick 1995). When the outcome consistently exceeds (misses) *all* benchmarks, there is no reference point conflict; otherwise, reference point conflict is said to exist (i.e., when some benchmarks are exceeded and some missed). Holding constant the net number of each type of benchmark exceeded or missed, overall judgment effects are stronger when there is no reference point conflict than when there is reference point conflict (Principle Three). This principle follows from mental accounting (Thaler 1985), which posits that gains and losses are mentally coded with respect to a reference point using the prospect theory value function, which is concave for gains and convex for losses, and steeper for losses than gains (Kahneman and Tversky 1979). Mental accounting suggests that holding constant the net outcome, evaluating a single positive (negative) outcome over a reference point leads to more positive (negative) judgment effects than evaluating two separate outcome components where one component is positive and the other negative (Thaler 1985). Applied to our context involving a discrete number of benchmarks missed or exceeded, this implies that the negative (positive) effect of missing (exceeding) one single benchmark is greater than that where two benchmarks are missed (exceeded) but one exceeded (missed).[6]

We apply Principle One to point, MID, and range guidance, and summarize the primary and/or secondary benchmarks associated with each in Table 1, Panel A. Point guidance has a primary benchmark (the best estimate) and no secondary benchmark. In contrast, range guidance involves the explicit mention of the higher and lower endpoints of the range, and the midpoint is only implicit and not directly mentioned. Thus, for range guidance, the two endpoints serve as primary benchmarks and the midpoint serves as a secondary benchmark. In contrast, MID guidance explicitly highlights the midpoint, while the two endpoints

---

[6] For a situation where the net effect is that benchmarks are missed, it is possible that the opposite prediction is obtained owing to the steeper slope of losses versus gains on the value function (see Thaler 1985). This occurs when the number of benchmarks exceeded is relatively large (but slightly smaller than the number of benchmarks missed). However, guidance forms are generally associated with a small and limited number of benchmarks, as with earnings thresholds (e.g., Degeorge et al. 1999), so this situation is unlikely to occur in these contexts.

TABLE 1
Predictions Based on the Multiple-Reference-Points Theory

Panel A: Type of Benchmarks in Different Guidance Forms

Guidance Form	Upper and Lower Endpoints	Midpoint
Point	Not Available	Primary
MID	Secondary	Primary
Range	Primary	Secondary

Panel B: Benchmark Effect on Investors' Earnings Reestimates When Actual Earnings Fall in the Lower End

Guidance Form	Benchmark(s) Missed	Benchmark(s) Exceeded	Investors' Earnings Reestimates
Point	One primary	—	Lowest
MID	One primary, one secondary	One secondary	In between
Range	One primary, one secondary	One primary	Highest

Panel A compares the type (primary versus secondary) of benchmarks among point, MID, and range guidance. Panel B analyzes the number and type of benchmark(s) missed and exceeded, respectively, when the actual earnings fall short of the point guidance and fall in the lower ends (i.e., fall below the midpoints but above the lower endpoints) of the range and MID guidance, as well as the predictions of investors' earnings reestimates after the actual earnings announcement.

are inferred. Thus, for MID guidance, the midpoint serves as a primary benchmark, and the inferred endpoints serve as secondary benchmarks.

Applying Principle One to our specific setting where actual earnings fall in the lower end, we also identify the primary and secondary benchmarks missed or exceeded for each guidance form. As Table 1, Panel B shows, for the range guidance, one primary benchmark (higher endpoint) and one secondary benchmark (midpoint) are missed, and one primary benchmark (lower endpoint) exceeded. For the MID guidance, one primary benchmark (midpoint) and one secondary benchmark (higher endpoint) are also missed, with one secondary benchmark exceeded (lower endpoint). In terms of the number of primary/secondary benchmarks exceeded or missed, both the range and MID guidance entail one primary benchmark and one secondary benchmark missed; the difference between these two guidance forms is that the benchmark exceeded is primary for the range guidance and secondary for the MID guidance. Applying Principles One and Two, this suggests that the positive impact of exceeding this benchmark is likely greater for the range guidance than for the MID guidance, so its impact in terms of dampening the overall negative effect of falling within the range is also likely to be greater for the range guidance than for the MID guidance. Investors' reestimates following the range guidance are, therefore, likely higher than those following the MID guidance.

When actual earnings fall short of the point guidance, only one primary benchmark is missed. When actual earnings fall in the lower end of the MID or range guidance, two benchmarks are missed and one is exceeded. Hence, there is reference point conflict for both the range and MID guidance but not for the point guidance (Principle Three). The MID guidance has, net, one primary benchmark missed, which is similar to that for the point guidance. Since the MID guidance involves reference point conflict, the negative judgment effect of having earnings fall in the lower end is smaller for the MID guidance than for the point guidance. Unlike the comparison between MID and point guidance, the range guidance has, net, one secondary benchmark missed while the point guidance has one primary benchmark missed. The effects of missing a benchmark are more severe for a primary benchmark than for a secondary benchmark (Principle Two). Together, Principles Two and Three suggest that the negative effects of having earnings fall in the lower end are smaller for the range guidance than for the point guidance. This discussion suggests that investors' earnings reestimates are higher for the range and MID guidance than for the point guidance.

In summary, we predict that when actual earnings are in the lower end, investors' reestimates will be highest given range guidance, followed by MID guidance, and then point guidance.

Knowledge Effect

Research on expertise indicates judgment differences between decision makers with high versus low knowledge (Alba and Hutchinson 1987; Smith and Kida 1991; Libby and Luft 1993; Ericsson and Lehmann 1996). Psychology literature indicates that high-knowledge decision makers are better able to pick up relevant contextual features and take them into consideration than low-knowledge decision makers (Johnson et al. 1981; Devine and Kozlowski 1995). High-knowledge decision makers have been shown to be able to incorporate more information into their judgments, and use more complex decision criteria (Chase and Simon 1973; Fiske et al. 1983; McNamara and McDaniel 2004). They are also better able to develop more causal relationships (Voss et al. 1983). In the financial accounting literature, Hopkins (1996) finds judgment differences between high- and low-knowledge financial analysts, classified by the extent to which they have knowledge of the causal relation between financing decisions (debt versus equity) and market reactions. He shows that labeling the same financial instrument as liability, equity, or mezzanine affects stock price predictions of high-knowledge analysts who have knowledge of stock market effects of different financing approaches (debt versus equity), but not those of their low-knowledge counterparts.

In the context of our study, we consider high-knowledge investors to be those who have superior knowledge (relative to low-knowledge investors) of different guidance forms (e.g., point versus range guidance) and the market effects of missing or beating benchmarks. Knowledge of different guidance forms facilitates the formation of primary and secondary benchmarks, while knowledge of the market effects of missing or meeting earnings expectations reflected in various management guidance forms indicates awareness of the importance of benchmarks in capital markets.

Our predictions on the effect of guidance form discussed earlier are contingent on investors' awareness and use of primary and secondary benchmarks. While primary benchmarks are explicitly stated and should be obvious to both low- and high-knowledge investors, secondary benchmarks are not explicitly stated and have to be inferred. High-knowledge investors likely have, in their knowledge structures, knowledge of various guidance forms and what the explicit or primary benchmarks are. This facilitates the inference of primary versus secondary benchmarks. For example, a high-knowledge investor given MID guidance can mentally draw a comparison between the given MID guidance with his/her knowledge of range guidance. This high-knowledge investor can infer that in the MID guidance, the endpoints are secondary in that they are not explicitly mentioned unlike the case of range guidance. Although the endpoints in the MID guidance are not explicitly mentioned, the high-knowledge investor likely also considers them as benchmarks (albeit secondary benchmarks) because of his/her awareness that in other guidance forms (i.e., range guidance), endpoints also serve as benchmarks. Thus, high-knowledge investors are more likely to invoke the use of both primary and secondary benchmarks in evaluating actual earnings, and our prediction above applies to high-knowledge investors. Formally stated, our hypothesis is as follows:

> **H1:** When actual earnings are in the lower end, high-knowledge investors' earnings reestimates are expected to be highest in the range condition, followed by the MID condition, and then by the point condition.

In contrast, the effect of guidance form on earnings reestimates is likely different for low-knowledge investors. Low-knowledge investors likely lack the knowledge that management guidance can come in different forms. Formation of secondary benchmarks may depend, in part, on the availability of characteristics of different guidance forms. For example, given a MID guidance form, a low-knowledge investor who does not or is unable to retrieve from memory the characteristics of range guidance may not infer that the endpoints (explicitly mentioned in range but not in MID guidance) serve as benchmarks. Prior research shows that low-knowledge decision makers have a tendency to simplify the task by eliminating certain important attributes or considerations (Johnson and Russo 1984; Alba and Hutchinson 1987; Ganzach 1994). Furthermore, low-knowledge investors' poorly structured general investment knowledge (Chi et al. 1981; Schoenfeld and Herrmann 1982; Tubbs 1992) may cause them to rely more on simplified decision rules. Novices' judgments have been shown to be influenced by the salience of the decision criteria presented in that they focus on the salient criteria and ignore the less salient ones (Bettman and Sujan 1987). In the financial accounting literature, Frederickson and Miller (2004) show that less sophisticated individual investors, but not financial analysts, are affected by pro forma earnings disclosures explicitly provided in the financial press release, even though these investors could have "undone" the effects of the pro forma disclosures. Their findings are consistent with a proclivity for low-knowledge investors to over-rely on information that is explicitly given. In our study, primary benchmarks associated with the guidance forms are explicitly mentioned, and therefore, more salient than the secondary benchmarks. Hence, we anticipate that low-knowledge investors are more likely to focus only on the primary benchmarks and neglect the secondary benchmarks. The three principles we discussed earlier apply, except that, as applied to low-knowledge investors, Principle One would suggest that benchmarks that are not explicitly mentioned are not weighted.

In the case of MID guidance, the midpoint is a concrete benchmark that is explicitly stated and salient, and serves as a criterion to evaluate actual earnings. Actual earnings that fall in the lower end miss the single primary benchmark (midpoint) in a MID guidance form, which is equivalent to missing the single benchmark in a point guidance form. Since there is no difference in the number and type of benchmarks (one primary benchmark missed) between the point and MID guidance, the negative judgment effects should be identical between these two guidance forms (Principle Two). In the case of range guidance, earnings that fall in the lower end miss one primary benchmark (higher endpoint) but also exceed another primary benchmark (lower endpoint). The range guidance is similar to the point and MID guidance in that one primary benchmark is missed. However, one primary benchmark is also exceeded for the range guidance, but none exceeded for the point and MID guidance. Applying Principle Two, this suggests that the negative reaction in terms of earnings reestimates in the case of the point and MID guidance will be more severe than that for the range guidance.[7]

Hence, our prediction is that low-knowledge investors' earnings reestimates are higher in the range condition than in the point and MID conditions. Their reestimates in the point and MID conditions are expected to be similar.

Our hypothesis is stated as follows:

H2: When actual earnings are in the lower end, low-knowledge investors' earnings reestimates are expected to be similar between the point condition and the MID condition, and both are expected to be lower than those in the range condition.

III. RESEARCH METHOD

Design

We employ a 3 × 2 (Guidance Form × Knowledge) between-subjects design to test our hypotheses. Participants are randomly assigned to three guidance form conditions: point, MID, and range. We also include a fourth treatment, the "midpoint + range" condition, which we report as part of our additional analyses. Knowledge is a measured variable.

Participants

Participants are 85 M.B.A. students from a major Singapore university, of which 64 participated in our main experiment and 21 participated in the additional "midpoint + range" condition. The mean (median) years of working experience is 7.2 (6.0). The participants have, on average, attended 2.4 (2.5) accounting (finance) courses. Seventy-four percent of them have investment experience in a stock market. They are each given movie vouchers worth about 20 Singapore dollars for participating in the experiment.

Procedure

The case materials relate to a semiconductor firm. They are modified from the materials used in Tan et al. (2002) and Libby et al. (2006). The background and financial information of Zetha are based on a real semiconductor company listed on the American Stock Exchange.

The experimental materials are divided into four sets, with each set (other than Set One, which is placed on top of the envelopes) contained in a separate envelope. Participants are instructed to answer the questions sequentially, and not to return to the previous envelope(s) after they have opened the next envelope(s). In Set One, participants first read the background information and three-year summary financial statements of Zetha. They then read the quarterly statements of financial-year 2001 and 2002, plus the first quarter statement of financial-year 2003. These statements are the same across all conditions.

Participants in the point condition read the following management's earnings guidance made by Zetha on May 15, 2003 concerning the second quarter EPS:

> The company expects earning per share for the quarter ending June 30, 2003 to be below expectations due to weaker than expected sales. Earnings per share are estimated to be approximately $0.16 for the quarter.

For participants in the range and MID conditions, management's earnings guidance is identical to that in the point condition except for the last sentence that varies as follows:

---

[7] Principle Three also predicts the same effect since there is reference point conflict for the range guidance but no reference point conflict for the point and MID guidance.

"Earnings per share are estimated to be between \$0.14 and \$0.18 for the quarter" (range condition), and "Earnings per share are estimated to be approximately \$0.16, plus or minus 2 cents for the quarter" (MID condition). Participants are then asked to estimate the EPS for the second quarter of 2003, full-year 2003, and full-year 2004. After that, participants complete some demographic questions before proceeding to Envelope A (which contains Set Two).

In Set Two, participants first read the actual earnings announcement made by Zetha on August 15, 2003:

	Quarter Ended June 30, 2003 \$'000
Net sales	48,920
Net income	3,519
Earnings per share	\$0.15

Again, this actual earnings announcement is the same for all conditions. Participants are then asked to reestimate the EPS for full-year 2003 and 2004.

After completing the main part of the experiment, participants are instructed to put Sets One and Two back into Envelope A, and proceed to Set Three (in Envelope B). Set Three contains questions measuring participants' perceptions of Zetha and its management, as well as manipulation check questions. Because psychology research suggests that decision makers' perceived familiarity with the topic affects their confidence in judgment (Trafimow and Sniezek 1994), we ask the following question in Set Three to assess participants' subjective familiarity with their assigned guidance form: "Please indicate your familiarity with the manner in which Zetha's management forecasted earnings" (measured on an 11-point scale with endpoints 1 = not at all familiar and 11 = extremely familiar).

Knowledge Test

As discussed earlier, we consider high-knowledge investors to be those with superior knowledge of different management guidance forms and their associated market effects. Our knowledge test comprises three questions. The first two questions measure participants' domain knowledge of management guidance forms. Question One (contained in Set Three) asks participants to assume they are the firm's management and about to issue earnings guidance. Their task is to list as many guidance forms as they can. Question Two (contained in Set Four) provides participants with management earnings guidance examples, and asks them to classify each example as point, range, minimum, maximum, qualitative, or other.

Question Three captures participants' awareness of the market effects of missing or meeting expectations associated with different management guidance forms. Because our experiment involves a setting where actual earnings fall in the *lower* end, we use a different context for Question Three. Specifically, we ask participants to predict stock price movements (rise, remain unchanged, or fall) when actual earnings *exceed* the point guidance or fall within the *upper* end of the range guidance.[8]

For Question One, we count the number of different guidance forms that the participant writes. For Question Two, we count the number of examples that the participant correctly classifies. For Question Three, if the participant predicts that for the point guidance, stock price will go up (versus remain unchanged or fall), then one point is given, and zero otherwise. If the participant predicts that stock price will be higher for the point guidance than for the range guidance, then one point is given, and zero otherwise (Libby et al. 2006). We standardize and sum the scores on the three questions so that we get a total knowledge score (TKS) for every participant. Our high-knowledge participants are those with above-mean TKS ($n = 42$) and low-knowledge participants are those with below-mean TKS ($n = 43$).

---

[8] Both Questions Two and Three include questions related to the MID guidance, but these are excluded from the knowledge test (our independent variable). We re-perform our main analyses by excluding Question Three from our knowledge measure, and obtain similar results.

IV. RESULTS

Manipulation Checks

In our experiment, we design actual earnings to be lower than the point guidance and the midpoints of the range and MID guidance, and higher than the lower endpoints in the latter two conditions (i.e., they are within the lower ends of the range and MID guidance). Seventy-five percent of the participants in the point condition correctly indicate that actual earnings are lower than the management guidance; of the remaining participants, 88 percent correctly indicate that actual earnings fall within the guidance range, and 90 percent correctly indicate that actual earnings are not in the upper end of the guidance range. Taken as a whole, 81 percent of all participants correctly answer the manipulation check questions. Results are unaffected by inclusion or exclusion of those participants who fail the manipulation check questions. Therefore, in the following sections, we report the results based on all participants.

Test of Hypotheses

Table 2 contains descriptive statistics of participants' earnings estimates and reestimates, as well as the adjusted marginal means of the reestimates for full-year 2003 and full-year 2004 (i.e., with earnings estimates for full-year 2003 and full-year 2004 made after the management guidance as a covariate, respectively) for point, range, and MID guidance conditions. We find that for both low- and high-knowledge participants, earnings estimates after management guidance are not affected by the management guidance form manipulation ($p > 0.59$), similar to the findings in Hirst et al. (1999) and Libby et al. (2006).

The results relating to the full-year 2003 and full-year 2004 EPS reestimates are similar, and we do not separately discuss them. Rather, we combine the two dependent measures, and analyze them as a repeated-measures factor in all analyses and discussions that follow.[9] To control for individual differences, participants' earnings estimates for the full-year 2003 and full-year 2004 after management guidance are included as covariates.

Overall, across both low- and high-knowledge participants, we find that reestimates are highest in the range condition, followed by the MID condition, then by the point condition (two-tailed pairwise comparisons p-values–Point/MID: $p = 0.08$; MID/Range: $p = 0.02$; Point/Range: $p = 0.00$). Table 3 reports the results of the contrast tests for high-knowledge participants, low-knowledge participants, and all participants as a whole.

Hypothesis 1 predicts that high-knowledge participants' earnings reestimates are highest in the range condition, followed by the MID condition, and then by the point condition. As shown in Table 3, Panel B, the linear-specific contrast test of this prediction is statistically significant ($F = 12.07$, $p = 0.00$). High-knowledge participants' earnings reestimates follow the predicted pattern, and all pairwise comparisons are statistically significant (Point/

---

[9] The repeated-measures factor is statistically insignificant for high-knowledge participants, low-knowledge participants, and all participants ($F = 0.88$, $p = 0.36$; $F = 0.03$, $p = 0.87$; $F = 0.45$, $p = 0.51$, respectively).

MID: p = 0.04; MID/Range: p = 0.03; Point/Range: p = 0.00; all one-tailed). Thus, H1 is supported.

Hypothesis 2 predicts that low-knowledge participants' earnings reestimates are similar between the point and MID conditions, and both are lower than those in the range condition. The linear-specific contrast test of this prediction is also significant (F = 5.66, p = 0.03; see Table 3, Panel C). The results of the paired contrast tests show that, as predicted,

TABLE 2
Investors' Earnings Estimates and Reestimates

Guidance Form		**Point**	**MID**	**Range**
Panel A: Sample Size				
High-Knowledge Participants		12	8	10
Low-Knowledge Participants		10	13	11
All Participants		22	21	21
Panel B: All Participants—Mean Earnings Estimates, Reestimates, and Adjusted Marginal Means of Reestimates after Inclusion of Earnings Estimates as Covariates (standard deviations in brackets; in $)				
Earnings Estimates	Quarter 2 of Year 2003	.17	.18	.17
		(.02)	(.02)	(.03)
	Full-Year 2003	.67	.70	.67
		(.09)	(.08)	(.09)
	Full-Year 2004	.75	.74	.73
		(.10)	(.09)	(.08)
Earnings Reestimates	Full-Year 2003	.61	.66	.68
		(.09)	(.09)	(.05)
	Full-Year 2004	.69	.72	.75
		(.13)	(.10)	(.06)
Adjusted Marginal Means of Earnings Reestimates	Full-Year 2003	.63	.65	.69
		(.02)	(.01)	(.01)
	Full-Year 2004	.69	.72	.76
		(.02)	(.01)	(.01)
Panel C: High-Knowledge Participants—Mean Earnings Estimates, Reestimates, and Adjusted Marginal Means of Reestimates after Inclusion of Earnings Estimates as Covariates (standard deviations in brackets; in $)				
Earnings Estimates	Quarter 2 of Year 2003	.18	.18	.18
		(.02)	(.01)	(.03)
	Full-Year 2003	.68	.68	.67
		(.11)	(.09)	(.08)
	Full-Year 2004	.74	.72	.72
		(.08)	(.10)	(.07)
Earnings Reestimates	Full-Year 2003	.59	.63	.70
		(.16)	(.10)	(.04)
	Full-Year 2004	.65	.70	.74
		(.12)	(.10)	(.06)
Adjusted Marginal Means of Earnings Reestimates	Full-Year 2003	.60	.64	.70
		(.02)	(.03)	(.02)
	Full-Year 2004	.65	.71	.76
		(.02)	(.03)	(.02)

(continued on next page)

TABLE 2 (continued)

Panel D: Low-Knowledge Participants—Mean Earnings Estimates, Reestimates, and Adjusted Marginal Means of Reestimates after Inclusion of Earnings Estimates as Covariates (standard deviations in brackets; in $)

Earnings Estimates	Quarter 2 of Year 2003	.16	.17	.17
		(.02)	(.02)	(.03)
	Full-Year 2003	.67	.71	.67
		(.07)	(.08)	(.10)
	Full-Year 2004	.77	.76	.74
		(.11)	(.08)	(.09)
Earnings Reestimates	Full-Year 2003	.64	.68	.67
		(.08)	(.09)	(.07)
	Full-Year 2004	.75	.73	.76
		(.13)	(.09)	(.06)
Adjusted Marginal Means of Earnings Reestimates	Full-Year 2003	.66	.66	.69
		(.02)	(.01)	(.02)
	Full-Year 2004	.74	.73	.76
		(.02)	(.01)	(.01)

Participants are assigned to one of three management guidance form conditions—point, MID, and range. Based on their scores on the knowledge test, they are divided into high- versus low-knowledge groups. Participants first read the management guidance for the EPS of the second quarter of year 2003. The point guidance indicates that "Earnings per share are estimated to be approximately $0.16 for the quarter." The MID guidance indicates that "Earnings per share are estimated to be approximately $0.16, plus or minus 2 cents for the quarter." The range guidance indicates that "Earnings per share are estimated to be between $0.14 and $0.18 for the quarter." Participants are then asked to provide EPS estimates for the second quarter of year 2003, full-year 2003, and full-year 2004, and their confidence in their earnings estimates. For all conditions, actual EPS of the second quarter of year 2003 is 15 cents. After the actual earnings announcement, participants are asked to provide their EPS reestimates for full-year 2003 and full-year 2004, and their confidence in these earnings reestimates. Confidence is measured on an 11-point scale ranging between 0 and 1.

Panel A reports the sample size of each cell.

For Panels B, C, and D, the adjusted marginal means of earnings reestimates for full-year 2003 (2004) include the full-year 2003 (2004) earnings estimates made after the issuance of management guidance as a covariate.

reestimates in the point and MID conditions do not differ ($p = 0.59$). Also, as expected, earnings reestimates in the point/MID condition are marginally/significantly lower than those in the range condition (one-tailed $p = 0.06/0.01$). Thus, H2 is supported.[10]

Confidence Effects

Prior studies have established the importance of investors' confidence as a variable of interest in that there is an association between investors' confidence and investment decisions (Barber and Odean 2001). Accounting research has also shown that investors'/analysts' confidence in their initial stock price/earnings predictions made immediately after they are presented with management's earnings guidance is lower when they are given range guidance as opposed to point guidance (Hirst et al. 1999; Libby et al. 2006).[11] This

---

[10] Our theory does not make explicit predictions about the effects of knowledge for a given guidance form. We investigate whether there are knowledge differences in investors' reestimates within each of the guidance forms, but find no statistically significant differences ($p > 0.18$).

[11] Prior research does not posit systematic effects of guidance form on investors'/analysts' confidence in earnings reestimates (Hirst et al. 1999; Libby et al. 2006). In our study, participants' confidence in earnings reestimates after the actual earnings announcement is not affected by management guidance form, which is true for high-knowledge participants ($F = 1.06$, $p = 0.36$), low-knowledge participants ($F = 0.60$, $p = 0.56$), and all participants as a whole ($F = 0.54$, $p = 0.59$). This pattern remains unchanged after including either familiarity with guidance form or confidence in earnings estimates as a covariate.

TABLE 3
Linear-Specific Contrast Tests and Pairwise Contrast Tests on Investors' Earnings Reestimates

Panel A: Linear-Specific Contrast Test for All Participants [Contrast Coefficients: Point (−2), MID (−1), Range (3)]

Source	SS	df	MS	F	p
Contrast	0.11	1	0.11	14.94	0.00
Error	0.39	54	0.01		

Panel B: Linear-Specific Contrast Test for High-Knowledge Participants [Contrast Coefficients: Point (−2), MID (−1), Range (3)]

Source	SS	df	MS	F	p
Contrast	0.12	1	0.12	12.07	0.00
Error	0.23	24	0.01		

Panel C: Linear-Specific Contrast Test for Low-Knowledge Participants [Contrast Coefficients: Point (−1), MID (−1), Range (2)]

Source	SS	df	MS	F	p
Contrast	0.02	1	0.02	5.66	0.03
Error	0.07	25	0.00		

Panel D: Pairwise Contrast Tests p-values (*one-tailed)

Participants	All	High-Knowledge	Low-Knowledge
$Reestimates_{point} < Reestimates_{MID}$	0.08	0.04*	0.59
$Reestimates_{MID} < Reestimates_{Range}$	0.02	0.03*	0.01*
$Reestimates_{point} < Reestimates_{Range}$	0.00	0.00*	0.06*

The tests are based on a repeated-measures factor comprising earnings reestimates for full-year 2003 and full-year 2004, with participants' earnings estimates for full-year 2003 and full-year 2004 included as covariates.

finding of lower (higher) confidence associated with range (point) guidance is attributable to one of three reasons: (1) provision of lower and upper limits in range guidance implies greater variability in eventual outcomes (suggested by Hirst et al. 1999); (2) presence of an explicit best estimate in point guidance implies less uncertainty in the eventual outcomes; or (3) both the above reasons apply.

The MID guidance allows us to disentangle these possibilities. If the provision of lower/upper limits is the dominant reason, then we expect $Confidence_{point} > Confidence_{MID} = Confidence_{range}$ because both the MID and range guidance provide lower/upper limits, while the point guidance does not. If it is the provision of an explicit best estimate that is the dominant reason, then we expect $Confidence_{point} = Confidence_{MID} > Confidence_{range}$ because both the point and MID guidance provide a best estimate, but the range guidance does not. Finally, if both reasons apply, then we expect $Confidence_{point} > Confidence_{MID} > Confidence_{range}$.

Results shown in Table 4 indicate that high-knowledge participants' confidence in their initial earnings estimates is marginally affected by the management guidance form manipulation ($F = 2.48$, $p = 0.10$) but the low-knowledge participants' is not ($F = 0.15$, $p = 0.86$). Contrast tests show that high-knowledge participants' confidence ratings in the point and MID conditions do not differ from each other ($p = 0.72$; two-tailed), and both

TABLE 4
Investors' Confidence in Earnings Estimates and Reestimates

Panel A: Participants' Mean Confidence in Earnings Estimates (standard deviations in brackets)

	Point	MID	Range
All Participants	.54	.54	.47
	(.17)	(.15)	(.25)
High-Knowledge Participants	.52	.55	.36
	(.17)	(.21)	(.22)
Low-Knowledge Participants	.56	.53	.56
	(.18)	(.10)	(.25)

ANOVA Test on High-Knowledge Participants' Confidence in Earnings Estimates

Source	SS	df	MS	F	p
Guidance Form	0.19	2	0.10	2.48	0.10
Error	1.02	26	0.04		

Two-Tailed Significance of Pairwise Comparisons for High-Knowledge Participants' Confidence in Earnings Estimates

$Confidence_{point}$ vs. $Confidence_{MID}$	$Confidence_{MID}$ vs. $Confidence_{range}$	$Confidence_{point}$ vs. $Confidence_{range}$
0.72	0.05	0.08

Panel B: Participants' Mean Confidence in Earnings Reestimates (standard deviations in brackets)

	Point	MID	Range
All Participants	.51	.57	.55
	(.16)	(.17)	(.18)
High-Knowledge Participants	.48	.59	.48
	(.14)	(.22)	(.17)
Low-Knowledge Participants	.55	.55	.62
	(.18)	(.14)	(.16)

Participants are assigned to one of three management guidance form conditions—point, MID, and range. Based on their scores on the knowledge test, they are divided into high- versus low-knowledge groups. Participants first read the management guidance for the EPS of the second quarter of year 2003. The point guidance indicates that "Earnings per share are estimated to be approximately \$0.16 for the quarter." The MID guidance indicates that "Earnings per share are estimated to be approximately \$0.16, plus or minus 2 cents for the quarter." The range guidance indicates that "Earnings per share are estimated to be between \$0.14 and \$0.18 for the quarter." Participants are then asked to provide EPS estimates for the second quarter of year 2003, full-year 2003, and full-year 2004, and their confidence in their earnings estimates. For all conditions, actual EPS for the second quarter of year 2003 is 15 cents. After the actual earnings announcement, participants are asked to provide their EPS reestimates for full-year 2003 and full-year 2004, and their confidence in these earnings reestimates. Confidence is measured on an 11-point scale ranging between 0 and 1.

are marginally or significantly higher than that in the range condition (Point/Range: p = 0.08; MID/Range: p = 0.05; both two-tailed). These results are consistent with the provision of a best estimate leading to increased investors' confidence in their earnings estimates.

"Midpoint + Range" Guidance

In our experiment, we also include a fourth guidance form, i.e., the "midpoint + range" guidance, which is a guidance form not currently used by management. This "midpoint + range" condition explicitly states both midpoint and range limits, and takes the form: "Earnings per share are estimated to be approximately \$0.16, varying from \$0.14 to \$0.18 for the quarter." We randomly assigned 21 M.B.A. students to the "midpoint + range" condition at the same time the main experiment was administered. The demographic background of these participants is similar to those participating in the main experiment. Based on their knowledge test responses, 12 of these participants are classified as high-knowledge, and 9 as low-knowledge.

Investigation of this hypothetical guidance form allows us to assess the specific characteristics associated with MID guidance that lead to the confidence results obtained above. Specifically, although our earlier findings are consistent with the provision of a best estimate or midpoint being the reason for the difference in high-knowledge investors' confidence between the range condition and the MID/point conditions, the results above could also be due to the explicit specification of half the range-width in the MID guidance (but the full range-width in the range guidance).

A "midpoint + range" guidance explicitly mentions the lower and upper limits of the range, as well as the midpoint. Therefore, if explicit mention of the midpoint is the primary reason responsible for the confidence difference, then investors' confidence should be the same between the MID guidance and the "midpoint + range" guidance (since both of them mention the midpoint), and both should be higher than that in the range guidance (since the midpoint is not explicitly mentioned in the range guidance). Similarly, if the "half range-width" effect is the primary reason responsible for the difference between the MID and range guidance, then investors' confidence should be the same between the range guidance and the "midpoint + range" guidance (since both mention the whole range-width), and both of them are expected to lead to lower confidence than the MID guidance (since only the MID guidance, but not the range or "midpoint + range" guidance, highlights half the range-width). It is also possible that both attributes matter, in which case investors' confidence is highest in the MID condition (midpoint and half the range-width mentioned), followed by the "midpoint + range" condition (midpoint mentioned), and then by the range condition (neither midpoint nor half the range-width mentioned).

Preliminary analysis indicates that high-knowledge participants' confidence in the "midpoint + range" condition (mean = 0.49) is similar to all the other three conditions (smallest p = 0.24). However, after we include participants' ratings of their familiarity with the guidance form as a covariate, confidence in the "midpoint + range" condition is higher than that in the range condition (p = 0.04), and is similar to that in the point condition (p = 0.80) and that in the MID condition (p = 0.39). This pattern provides additional evidence that high-knowledge investors' confidence is mainly affected by the specification of the best estimate or midpoint in the management guidance.[12,13]

Within-Subjects Test: Effects of Awareness of Alternative Guidance Forms

Recall that we argue that the reestimates effects for low-knowledge participants arise because when they are presented with a specific guidance form (e.g., MID guidance), they either do not or are unable to retrieve from their knowledge structures alternative guidance forms (e.g., range guidance) with which to compare. Accordingly, these low-knowledge participants rely primarily on benchmarks explicitly mentioned. If the availability of alternative guidance forms in memory is the mechanism responsible for the effects between low- and high-knowledge participants, then a within-subjects test allows us to test the validity of this mechanism.

In the within-subjects setting, all three guidance forms are presented. Hence, if failure to retrieve alternative guidance forms in memory is a source of our results in the main experiment, then we anticipate that in the within-subjects setting, these low-knowledge participants' reactions will mirror those obtained for the high-knowledge participants in our main experiment (i.e., $Reestimates_{point} > Reestimates_{MID} > Reestimates_{range}$). Similarly, if high-knowledge participants are already able to retrieve alternative guidance forms from memory, then presentation of all three guidance forms is not expected to lead them to respond differently than they did in the main experiment.

After completing the main part of the experiment, participants are asked to compare three management guidance forms, i.e., the point, MID, and range guidance, in a within-subjects setting (see Tan et al. 2002). We ask participants to directly predict the effect of guidance form on stock prices to assess whether the effects on EPS reestimates in our main experiment generalize to stock prices. Table 5 reports the results of the within-subjects tests based on participants' responses with respect to whether stock price will rise, remain unchanged, or fall if actual EPS falls in the lower end. The percentages in Table 5, Panel A refer to those participants who think stock price will fall (versus rise or remain unchanged). The corresponding Wilcoxon test results are reported in Table 5, Panel B.

Results suggest that in the within-subjects setting, low-knowledge participants' responses are different from those in the between-subjects setting, and mimic those of high-knowledge participants in the main experiment. This finding suggests that supplying low-knowledge participants with various guidance forms facilitates their comparisons among guidance forms, and, therefore, their comparisons of primary versus secondary benchmarks. In addition, the within-subjects test replicates the between-subjects findings for the high-knowledge participants. Cumulatively, the evidence is consistent with our arguments that high- (low-) knowledge participants are more (less) able to retrieve alternative

---

[12] With respect to low-knowledge participants, consistent with our main finding that their confidence is unaffected by guidance form, we find that their confidence in the "midpoint + range" condition (mean = 0.61) is not different from any other conditions (smallest p = 0.29). This pattern holds after inclusion of familiarity with guidance form as a covariate (smallest p = 0.22).

[13] For high-knowledge participants, reestimates in the "midpoint + range" condition (raw means for full-year 2003/2004 = 0.70/0.76; adjusted marginal means by including full-year 2003/2004 estimate as a covariate = 0.70/0.74) are higher than those in the point condition (p = 0.00); they also fall between those of the MID and range guidance, but are not statistically significantly different from each of these (p > 0.25). Low-knowledge participants' reestimates in the "midpoint + range" condition (raw means for full-year 2003/2004 = 0.65/0.71; adjusted marginal means by including full-year 2003/2004 estimate as a covariate = 0.64/0.72) are lower than those in the range condition (p = 0.01), but not significantly different from those in the point condition (p = 0.22) or MID condition (p = 0.39).

TABLE 5
Within-Subjects Tests

Panel A: Percentages of Participants Who Think Stock Price Will Fall (versus Remain Unchanged or Rise) when Actual Earnings Fall in the Lower End

	Point	MID	Range
All Participants	60.2%	35.4%	22.0%
High-Knowledge Participants	69.0%	33.3%	21.4%
Low-Knowledge Participants	51.2%	39.5%	20.9%

Panel B: Wilcoxon Tests for the Differences among Guidance Forms (one-tailed p-values)

	$\%_{\text{point}} > \%_{\text{MID}}$	$\%_{\text{MID}} > \%_{\text{range}}$	$\%_{\text{point}} > \%_{\text{range}}$
All Participants	.00	.01	.00
High-Knowledge Participants	.00	.07	.00
Low-Knowledge Participants	.10	.01	.00

After the main experiment, participants are asked to predict, in a within-subjects setting, whether stock price will rise, remain unchanged, or fall if actual earnings fall below the point guidance and fall in the lower ends of the MID and range guidance.

Panel A reports the percentages of participants who think stock price will fall (versus rise or remain unchanged). Panel B reports the one-tailed p-values for the relevant Wilcoxon tests.

guidance forms from memory when they are presented with a specific guidance form from management.[14]

V. CONCLUSION

In this study, we introduce and test the multiple-reference-points theory as an explanation for the effects of management guidance forms on investors' earnings reestimates made after actual earnings announcements. We extend prior research by demonstrating that it is not merely the number of explicit benchmarks that matters (Libby et al. 2006), but rather, the type of benchmarks (primary and secondary) matters as well in influencing investors' earnings reestimates' reactions to management guidance forms. We also test features of point versus range guidance responsible for confidence effects documented in Hirst et al. (1999), and show that it is the specific mention of a best estimate (in point guidance) rather than the provision of lower/upper limits (in range guidance) that accounts for these confidence effects.

Our study also describes properties of MID guidance, an emerging form of management guidance that is a hybrid of point and range guidance. The MID guidance is coded either as a point or range form in the FirstCall database, reflecting an assumption that the properties of MID guidance are not different from those of point or range guidance. Our study indicates that this assumption may not be correct. Our results show that investors' earnings reestimates following MID guidance do not necessarily mirror those associated with point or range guidance. For example, for high-knowledge investors, earnings reestimates given MID guidance lie between those associated with point and range guidance; that is, when actual earnings fall in the lower end, earnings reestimates related to MID guidance are higher than those related to point guidance but lower than those related to range guidance.

---

[14] After the main experiment, we ask ten questions to assess participants' perceptions of Zetha (related to its earnings volatility, riskiness, quality of disclosures, earnings surprise, earnings growth potential) and its management (competence, integrity, extent management is forthcoming, intention to misguide market, forecast accuracy). Results indicate that issuing a MID guidance form does not result in differential perceptions of the company or its management, implying no additional cost or benefit to management in terms of investors' perceptions.

In addition, although the influence of guidance forms has been of much research interest (e.g., Hirst et al. 1999; Libby et al. 2006), there is no evidence on how knowledge moderates this effect. Our results demonstrate that the effects of guidance forms are contingent on investors' knowledge. Low-knowledge investors' earnings reestimates follow a different pattern compared with those of high-knowledge investors. We also find that only high-knowledge investors are more confident in their earnings estimates when they are given MID guidance or point guidance as opposed to range guidance. In contrast, low-knowledge investors' confidence is not affected by guidance form. Hence, if management's objective in issuing a hybrid MID guidance form is to capture positive effects associated with both point and range guidance (i.e., higher reestimates than point guidance and also higher confidence than range guidance, when actual earnings fall in the lower end), then our results suggest that this objective is achieved only in the case of high-knowledge investors (see Hopkins 1996).

Our findings also extend our understanding of the impact of range guidance. Libby et al. (2006) compare analysts' earnings reestimates when they are given point versus range guidance. In their first experiment, the range-width is 12 cents (a relatively wide range not frequently used in practice) when the actual EPS falls within the range guidance, with range-width being 4 cents when the actual EPS falls outside the range. It is unclear whether their findings are attributable to the range being wide, or the actual EPS falling within the range. In our study, the range-width is 4 cents (a narrow range) and the actual EPS falls within the range. Our results, combined with Libby et al. (2006), suggest that the dampening effect of falling within the range is applicable to both wide and narrow range guidance.

The general limitations of laboratory experiments apply to the present study. One limitation is that we focus on individual reactions, and we provide no evidence on whether the results can be generalized to the aggregate market level. However, that concern is mitigated by increasing evidence suggesting market inefficiency (Kothari 2001; Libby et al. 2002).

Another limitation relates to using M.B.A. students as participants, and whether the results generalize to more sophisticated investors. However, M.B.A. students represent relatively informed individual investors (Maines and McDaniel 2000), and our results concerning comparisons for high-knowledge participants between point versus range guidance largely replicate prior research in which participants are professional analysts (Libby et al. 2006).[15] On this point, our results have methodological implications for experimentalists. It is difficult to access and recruit financial analysts to participate in financial accounting experiments. Our results suggest that a certain subset of M.B.A. students (i.e., those M.B.A. students who are equipped with relevant knowledge) may possibly serve as substitutes for financial analysts, or as a proxy for knowledgeable investors. To the extent that the required knowledge can be identified and measured, we recommend that researchers who have interest in this target group measure participants' knowledge to identify those representative of more sophisticated players in the market (Elliott et al. 2007).

---

[15] For example, as in Libby et al. (2006), high-knowledge participants' confidence after management guidance in the point condition is significantly higher than that in the range condition, and reestimates after the actual earnings announcement are higher in the range condition than those in the point condition, when the actual earnings fall in the lower end.

Finally, refinements can be made to our theory. For example, we assume investors use a simple counting mechanism of benchmarks missed/exceeded, but this assumption may not hold when there are many benchmarks to assess across time (Ordonez et al. 2000). Future research can also investigate how investors react to guidance forms that have multiple benchmarks but differ in terms of *both* type and number of benchmarks.

REFERENCES

Alba, J. W., and J. W. Hutchinson. 1987. Dimensions of consumer expertise. *The Journal of Consumer Research* 13 (4): 411–454.

Baginski, S. P., E. J. Conrad, and J. M. Hassell. 1993. The effects of management forecast precision on equity pricing and on the assessment of earnings uncertainty. *The Accounting Review* 68 (October): 913–927.

———, and J. M. Hassell. 1997. Determinants of management forecast precision. *The Accounting Review* 72 (April): 303–312.

Barber, B. M., and T. Odean. 2001. Boys will be boys: Gender, overconfidence, and common stock investment. *The Quarterly Journal of Economics* 116 (1): 261–292.

Bettman, J. R., and M. Sujan. 1987. Effects of framing on evaluation of comparable and noncomparable alternatives by expert and novice consumers. *The Journal of Consumer Research* 14 (September): 141–154.

Blount, S., M. C. Thomas-Hunt, and M. A. Neale. 1996. The price is right—Or is it? A reference point model of two-party price negotiations. *Organizational Behavior and Human Decision Processes* 68 (October): 1–12.

Boles, T. L., and D. M. Messick. 1995. A reverse outcome bias: The influence of multiple reference points on the evaluation of outcomes and decisions. *Organizational Behavior and Human Decision Processes* 61 (March): 262–275.

Bowen, R. M., A. K. Davis, and D. A. Matsumoto. 2005. Emphasis on pro forma versus GAAP earnings in quarterly press releases: Determinants, SEC intervention, and market reactions. *The Accounting Review* 80 (October): 1011–1038.

Brown, L. D. 2001. A temporal analysis of earnings surprises: Profits versus losses. *Journal of Accounting Research* 39 (2): 221–241.

Chase, W. G., and H. A. Simon. 1973. The mind's eye in chess. In *Visual Information Processing*, edited by W. G. Chase, 215–281. New York, NY: Academic Press.

Chi, M. T. H., P. J. Feltovich, and R. Glaser. 1981. Categorization and representation of physics problems by experts and novices. *Cognitive Science* 5 (April–June): 121–152.

Cotter, J., A. I. Tuna, and P. D. Wysocki. 2006. Expectations management and beatable targets: How do analysts react to explicit earnings guidance? *Contemporary Accounting Research* 23 (3): 583–624.

Degeorge, F., J. Patel, and R. Zeckhauser. 1999. Earnings management to exceed thresholds. *Journal of Business* 72 (1): 1–33.

Devine, D. J., and S. W. J. Kozlowski. 1995. Domain-specific knowledge and task characteristics in decision making. *Organizational Behavior and Human Decision Processes* 64 (3): 294–306.

Diener, E., E. Sandvik, and W. Pavot. 1991. Happiness is the frequency, not the intensity, of positive versus negative affect. In *Subjective Well-Being: An Interdisciplinary Perspective*, edited by F. Strack, M. Argyle, and Sc. N. Schwarz, 119–139. Elmsford, NY: Pergamon Press.

Elliott, W. B., F. D. Hodge, J. Kennedy, and M. Pronk. 2007. Are M.B.A. students a good proxy for non-professional investors? *The Accounting Review* 82 (1): 139–168.

Ericsson, K. A., and A. C. Lehmann. 1996. Expert and exceptional performance: Evidence of maximal adaptation to task constraints. *Annual Review of Psychology* 47: 273–305.

Fiske, S. T., D. R. Kinder, and W. M. Larter. 1983. The novice and the expert: Knowledge-based strategies in political cognition. *Journal of Experimental Social Psychology* 19 (4): 381–400.

Frederickson, J. R., and J. S. Miller. 2004. The effects of pro forma earnings disclosures on analysts' and nonprofessional investors' equity valuation judgments. *The Accounting Review* 79 (3): 667–686.

Ganzach, Y. 1994. Theory and configurality in expert and layperson judgment. *Journal of Applied Psychology* 79 (3): 439–448.

Gregory, R., S. Lichtenstein, and D. MacGregor. 1993. The role of past states in determining reference points for policy decisions. *Organizational Behavior and Human Decision Processes* 55 (2): 195–206.

Healy, P. M., and K. G. Palepu. 2001. Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature. *Journal of Accounting and Economics* 31 (September): 405–440.

Hirst, D. E., L. Koonce, and J. Miller. 1999. The joint effect of management's prior forecast accuracy and the form of its financial forecast on investor judgment. *Journal of Accounting Research* 37 (Supplement): 101–124.

Hopkins, P. E. 1996. The effect of financial statement classification of hybrid financial instruments on financial analysts' stock price judgments. *Journal of Accounting Research* 34 (Supplement): 33–50.

Johnson, E. J., and J. E. Russo. 1984. Product familiarity and learning new information. *The Journal of Consumer Research* 11 (June): 542–550.

Johnson, P. E., A. S. Duran, F. Hassebrock, J. Moller, M. Prietula, P. J. Feltovich, and D. B. Swanson. 1981. Expertise and error in diagnostic reasoning. *Cognitive Science* 5 (3): 235–283.

Kahneman, D., and A. Tversky. 1979. Prospect theory: An analysis of decision under risk. *Econometrica* 47 (March): 263–292.

Kida, T., and J. F. Smith. 1995. The encoding and retrieval of numerical data for decision making in accounting contexts: Model development. *Accounting, Organizations and Society* 20 (October/November): 585–610.

———, ———, and M. Maletta. 1998. The effects of encoded memory traces for numerical data on accounting decision making. *Accounting, Organizations and Society* 23 (5/6): 451–466.

Kothari, S. P. 2001. Capital markets research in accounting. *Journal of Accounting and Economics* 31 (September): 105–231.

Krische, S. D. 2005. Investors' evaluations of strategic prior-period benchmark disclosures in earnings announcements. *The Accounting Review* 80 (1): 243–268.

Libby, R., and J. Luft. 1993. Determinants of judgment performance in accounting settings: Ability, knowledge, motivation and environment. *Accounting, Organizations and Society* 18 (5): 425–450.

———, R. Bloomfield, and M. W. Nelson. 2002. Experimental research in financial accounting. *Accounting, Organizations and Society* 27 (8): 775–810.

———, H. T. Tan, and J. E. Hunton. 2006. Does the form of managements' earnings guidance affect analysts' earnings forecasts? *The Accounting Review* 81 (1): 251–270.

Maines, L. A., and L. S. McDaniel. 2000. Effects of comprehensive-income characteristics on nonprofessional investors' judgments: The role of financial-statement presentation format. *The Accounting Review* 75 (April): 179–207.

McNamara, D. S., and M. A. McDaniel. 2004. Suppressing irrelevant information: Knowledge activation or inhibition? *Journal of Experimental Psychology: Learning, Memory, and Cognition* 30 (2): 465–482.

Ordonez, L. D., T. Connolly, and R. Coughlan. 2000. Multiple reference points in satisfaction and fairness assessment. *Journal of Behavioral Decision Making* 13: 329–344.

Pownall, G., C. Wasley, and G. Waymire. 1993. The stock price effects of alternative types of management earnings forecasts. *The Accounting Review* 68 (October): 896–912.

Schoenfeld, A. H., and D. J. Herrmann. 1982. Problem perception and knowledge structure in expert and novice mathematical problem solvers. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 8 (5): 484–494.

Schrand, C. M., and B. R. Walther. 2000. Strategic benchmarks in earnings announcements: The selective disclosure of prior-period earnings components. *The Accounting Review* 75 (2): 151–177.

Smith, J. F., and T. Kida. 1991. Heuristics and biases: Expertise and task realism in auditing. *Psychological Bulletin* 109 (3): 472–489.

Soffer, L. C., S. R. Thiagarajan, and B. R. Walther. 2000. Earnings preannouncement strategies. *Review of Accounting Studies* 5 (March): 5–26.

Sullivan, K., and T. Kida. 1995. The effect of multiple reference points and prior gains and losses on managers' risky decision making. *Organizational Behavior and Human Decision Processes* 64 (October): 76–83.

Tan, H. T., R. Libby, and J. E. Hunton. 2002. Analysts' reactions to earnings preannouncement strategies. *Journal of Accounting Research* 40 (March): 223–246.

Thaler, R. H. 1985. Mental accounting and consumer choice. *Marketing Science* 4 (3): 199–214.

Trafimow, D., and J. A. Sniezek. 1994. Perceived expertise and its effect on confidence. *Organizational Behavior and Human Decision Processes* 57 (2): 290–302.

Tubbs, R. M. 1992. The effect of experience on the auditor's organization and amount of knowledge. *The Accounting Review* 67 (4): 783–801.

Voss, J. F., T. R. Greene, T. A. Post, and B. Penner. 1983. Problem-solving skill in the social sciences. In *Psychology of Learning and Motivation*, 17, edited by G. Bower, 165–213. New York, NY: Academic Press.

Editorial Data

The following table contains information about turnaround time for manuscripts (including revisions) on which editorial decisions were made in the 12-month period ended December 31, 2006. Turnaround time is the number of days between the date that the manuscript was received *and the date of the editor's letter to the author(s).*

	Number of Manuscripts	Percent	Cumulative Number	Cumulative Percent
0 ≤ Days ≤ 30	68	16.23	68	16.23
31 ≤ Days ≤ 60	173	41.29	241	50.96
61 ≤ Days ≤ 90	110	26.25	351	83.77
91 ≤ Days ≤ 120	52	12.41	403	96.18
121 ≤ Days	16	3.82	419	100.00
Total	419	100.00		

The mean review time was 58.66; the median review time was 56 days.

New Submissions by calendar year (January 1 to December 31)

1992	241
1993	234
1994	231
1995	195
1996	230
1997	195
1998	196
1999	239
2000	260
2001	260*
2002	324
2003	327
2004	307
2005	389
2006	413

* 2001—in addition to the 260 regular submissions, 68 MSs were submitted to the *TAR* Quality of Earnings Conference.

The acceptance rate (defined as number of MSs accepted divided by the number of new submissions) over the past 5 years is between 12–16% per year.

EDITORIAL POLICY AND STYLE INFORMATION

EDITORIAL POLICY

According to the policies set by the Publications Committee (which were endorsed by the Executive Committee and were published in the *Accounting Education News*, June 1987), *The Accounting Review* "should be viewed as the premier journal for publishing articles reporting the results of accounting research and explaining and illustrating related research methodology. The scope of acceptable articles should embrace any research methodology and any accounting-related subject, as long as the articles meet the standards established for publication in the journal ... No special sections should be necessary. The primary, but not exclusive, audience should be—as it is now—academicians, graduate students, and others interested in accounting research."

The primary criterion for publication in *The Accounting Review* is the significance of the contribution an article makes to the literature.

The efficiency and effectiveness of the editorial review process is critically dependent upon the actions of both authors submitting papers and the reviewers. Authors accept the responsibility of preparing research papers at a level suitable for evaluation by independent reviewers. Such preparation, therefore, should include subjecting the manuscript to critique by colleagues and others and revising it accordingly prior to submission. The review process is not to be used as a means of obtaining feedback at early stages of developing the research.

Reviewers and associate editors are responsible for providing critically constructive and prompt evaluations of submitted research papers based on the significance of their contribution and on the rigor of analysis and presentation. Associate editors also make editorial recommendations to the editor.

MANUSCRIPT PREPARATION AND STYLE

The Accounting Review's manuscript preparation guidelines follow *The Chicago Manual of Style* (15th ed.; University of Chicago Press). Another helpful guide to usage and style is *The Elements of Style*, by William Strunk, Jr., and E. B. White (Macmillan). Spelling follows *Webster's Collegiate Dictionary.*

FORMAT

1. All manuscripts should be printed in 12-point font on one side of 8½ × 11" good quality paper and be double-spaced, except for indented quotations.
2. Manuscripts should be as concise as the subject and research method permit, generally not to exceed 7,000 words.
3. Margins of at least one inch from top, bottom, and sides should facilitate editing and duplication.
4. To promote anonymous review, authors should not identify themselves directly or indirectly in their papers or in experimental test instruments included with the submission. Single authors should not use the editorial "we."
5. A cover page should show the title of the paper, the author's name, title and affiliation, email address, any acknowledgments, and a footnote indicating whether the author would be willing to share the data (see last paragraph in this statement).

Pagination: All pages, including tables, appendices and references, should be serially numbered. Major sections should be numbered in Roman numerals. Subsections should not be numbered.

Numbers: Spell out numbers from one to ten, except when used in tables and lists, and when used with mathematical, statistical, scientific, or technical units and quantities, such as distances, weights and measures. For example: *three days; 3 kilometers; 30 years.* All other numbers are expressed numerically.

Percentages and Decimal Fractions: In nontechnical copy use the word percent in the text.

Hyphens: Use a hyphen to join unit modifiers or to clarify usage. For example: *a well-presented analysis; re-form.* See *Webster's* for correct usage.

Keywords: The abstract is to be followed by four keywords that will assist in indexing the paper.

ABSTRACT/INTRODUCTION

An Abstract of about 100 words should be presented on a separate page immediately preceding the text. The Abstract should concisely inform the reader of the manuscript's topic, its methods, and its findings. Keywords and the Data Availability statements should follow the Abstract. The text of the paper should start with a section labeled "I. Introduction," which provides more details about the paper's purpose, motivation, methodology, and findings. Both the Abstract and the Introduction should be relatively nontechnical, yet clear enough for an informed reader to understand the manuscript's contribution. The manuscript's title, but neither the author's name nor other identification designations, should appear on the Abstract page.

TABLES AND FIGURES

The author should note the following general requirements:

1. Each table and figure (graphic) should appear on a separate page and should be placed at the end of the text. Each should bear an Arabic number and a complete title indicating the exact contents of the table or figure. Tables and figures should define each variable. The titles and definitions should be sufficiently detailed to enable the reader to interpret the tables and figures without reference to the text.
2. A reference to each graphic should be made in the text.
3. The author should indicate by marginal notation where each graphic should be inserted in the text.
4. Graphics should be reasonably interpreted without reference to the text.
5. Source lines and notes should be included as necessary.

Equations: Equations should be numbered in parentheses flush with the right-hand margin.

DOCUMENTATION

Citations: Work cited should use the "author-date system" keyed to a list of works in the reference list (see below). Authors should make an effort to include the relevant page numbers in the cited works.

1. In the text, works are cited as follows: authors' last name and date, without comma, in parentheses: for example, (Jones 1987); with two authors: (Jones and Freeman 1973); with more than two: (Jones et al. 1985); with more than one source cited together (Jones 1987; Freeman 1986); with two or more works by one author: (Jones 1985, 1987).
2. Unless confusion would result, do not use "p." or "pp." before page numbers: for example, (Jones 1987, 115).
3. When the reference list contains more than one work of an author published in the same year, the suffix a, b, etc. follows the date in the text citation: for example, (Jones 1987a) or (Jones 1987a; Freeman 1985b).
4. If an author's name is mentioned in the text, it need not be repeated in the citation; for example, "Jones (1987, 115) says ..."
5. Citations to institutional works should use acronyms or short titles where practicable; for example, (AAA ASOBAT 1966); (AICPA Cohen Commission Report 1977). Where brief, the full title of an institutional work might be shown in a citation: for example, (ICAEW *The Corporate Report* 1975).
6. If the manuscript refers to statutes, legal treatises or court cases, citations acceptable in law reviews should be used.

Reference List: Every manuscript must include a list of references containing only those works cited. Each entry should contain all data necessary for unambiguous identification. With the author-date system, use the following format recommended by *The Chicago Manual*:

1. Arrange citations in alphabetical order according to surname of the first author or the name of the institution responsible for the citation.
2. Use author's initials instead of proper names.
3. Date of publication should be placed immediately after author's name.
4. Titles of journals should not be abbreviated.
5. Multiple works by the same author(s) in the same year are distinguished by letters after the date.
6. Inclusive page numbers are treated as recommended in *Chicago Manual* section 17.168.E.

Sample entries are as follows:

American Accounting Association, Committee on Concepts and Standards for External Financial Reports. 1977. *Statement on Accounting Theory and Theory Acceptance.* Sarasota, FL: AAA.

Demski, J. S., and D. E. M. Sappington. 1989. Hierarchical structure and responsibility accounting. *Journal of Accounting Research* 27 (Spring): 40–58.

Dye, R., B. Balachandran, and R. Magee. 1989. Contingent fees for audit firms. Working paper, Northwestern University, Evanston, IL.

Fabozzi, F., and I. Pollack, eds. 1987. *The Handbook of Fixed Income Securities*. 2nd edition. Homewood, IL: Dow Jones-Irwin.

Kahneman, D., P. Slovic, and A. Tversky, eds. 1982. *Judgment Under Uncertainty: Heuristics and Biases.* Cambridge, U.K.: Cambridge University Press.

Porcano, T. M. 1984a. Distributive justice and tax policy. *The Accounting Review* 59 (October): 619–636.

———. 1984b. The perceived effects of tax policy on corporate investment intentions. *The Journal of the American Taxation Association* 6 (Fall): 7–19.

Shaw, W. H. 1985. Empirical evidence on the market impact of the safe harbor leasing law. Ph.D. dissertation, The University of Texas at Austin.

Sherman, T. M., ed. 1984. *Conceptual Framework for Financial Accounting*. Cambridge, MA: Harvard Business School.

Footnotes: Footnotes are not used for documentation. Textual footnotes should be used only for extensions and useful excursions of information that if included in the body of the text might disrupt its continuity. Footnotes should be consecutively numbered throughout the manuscript with superscript Arabic numerals. Footnote text should be doubled-spaced and placed at the end of the article.

SUBMISSION OF MANUSCRIPTS

Authors should note the following guidelines for submitting manuscripts:

1. Manuscripts currently under consideration by another journal or publisher should not be submitted. The author must state that the work is not submitted or published elsewhere.
2. For manuscripts reporting on field surveys or experiments: If the additional documentation (e.g., questionnaire, case, interview schedule) is sent as a separate file, then all information that might identify the author(s) must be deleted from the instrument.
3. MS should be submitted via email as Microsoft® Word or PDF files to the *TAR* office at TARUAZ@email.arizona.edu. A submission letter, a separate cover page, and the MS containing no author identification should be emailed as separate files. The submission fee should be paid online (VISA or MasterCard only) at: https://aaahq.org/AAAforms/journals/tarsubmit.cfm. If unable to pay online, a check in U.S. funds, made payable to the American Accounting Association, may be sent to Professor Dan Dhaliwal, Senior Editor, *The Accounting Review*, The University of Arizona, Department of Accounting, McClelland Hall 301, 1130 E. Helen Street, Tucson, AZ 85721-0108. The submission fee in U.S. funds is $125.00 for members and $200.00 for nonmembers of the AAA. Effective January 1990, the submission fee is nonrefundable.
4. The author should retain a copy of the paper.
5. Revisions must be submitted within 12 months from request, otherwise they will be considered new submissions.

COMMENTS

Comments on articles previously published in *The Accounting Review* will be reviewed (anonymously) by two reviewers in sequence. The first reviewer will be the author of the original article being subjected to critique. If substance permits, a suitably revised comment will be sent to a second reviewer to determine its publishability in *The Accounting Review*. If a comment is accepted for publication, the original author will be invited to reply. All other editorial requirements, as enumerated above, also apply to proposed comments.

POLICY ON REPRODUCTION

An objective of *The Accounting Review* is to promote the wide dissemination of the results of systematic scholarly inquiries into the broad field of accounting.

Permission is hereby granted to reproduce any of the contents of the *Review* for use in courses of instruction, as long as the source and American Accounting Association copyright are indicated in any such reproductions.

Written application must be made to the American Accounting Association, 5717 Bessie Drive, Sarasota, FL 34233-2399, for permission to reproduce any of the contents of the *Review* for use in other than courses of instruction—e.g., inclusion in books of readings or in any other publications intended for general distribution. In consideration for the grant of permission by the *Review* in such instances, the applicant must notify the author(s) in writing of the intended use to be made of each reproduction. Normally, the *Review* will not assess a charge for the waiver of copyright.

Except where otherwise noted in articles, the copyright interest has been transferred to the American Accounting Association. Where the author(s) has (have) not transferred the copyright to the Association, applicants must seek permission to reproduce (for all purposes) directly from the author(s).

POLICY ON DATA AVAILABILITY

The following policy has been adopted by the Executive Committee in its April 1989 meeting. "An objective of (*The Accounting Review, Accounting Horizons, Issues in Accounting Education*) is to provide the widest possible dissemination of knowledge based on systematic scholarly inquiries into accounting as a field of professional research, and educational activity. As part of this process, authors are encouraged to make their data available for use by others in extending or replicating results reported in their articles. Authors of articles which report data dependent results should footnote the status of data availability and, when pertinent, this should be accompanied by information on how the data may be obtained."

MARCH 2007 PLACEMENT ADS

*The deadline for information to be included in the "Placement Information" section is two months prior to the date of publication. The **Review** is published in January, March, May, July, and October. Placement advertising and replies should be sent to the American Accounting Association, 5717 Bessie Drive, Sarasota, FL 34233-2399, ATTENTION: ADVERTISING DEPT. All replies to box numbers should be on separate sheets to facilitate forwarding.*

201 NORTH CAROLINA A&T STATE UNIVERSITY, School of Business and Economics, Department of Accounting, invites applications for August 2007 tenure-track positions. Qualified candidates in all areas will be considered. However, preference will be given to candidates with interests in financial accounting, managerial accounting, and accounting information systems. The Department of Accounting serves over 350 majors and is accredited by AACSB International. Candidates should hold a Ph.D. in Accounting. Applications will also be accepted from individuals holding a Ph.D. in Information Systems with training and/or experience in accounting. Professional certifications are desirable, and a commitment to quality teaching and scholarly research is essential. Review of applications will begin immediately and continue until the positions are filled. The University is a Carnegie "High Research Activities" institution with an enrollment of approximately 11,000. Candidates should send a *vita* to: Dr. Ida Robinson Backmon, Chair, Department of Accounting, School of Business and Economics, Merrick Hall, North Carolina A&T State University, Greensboro, NC 27411: Phone (336) 334-7581, Ext. 6001: Fax (336) 256-2274. The University is an AA/EO employer.

202 INDIANA UNIVERSITY, Department of Accounting, invites applications for a Clinical Asst/Assoc/Full Professor position effective Fall 2007. The focus of this position will be auditing. Clinical faculty members hold full-time positions. They focus their effort on teaching, direct supervision of student activities, mentoring, and other forms of instruction. They should bring considerable executive-level work experience, advanced degree desirable, and other talents into the classroom as an important part of the instructional mission of the University. The teaching load is nine credit hours per semester. After a probationary period, clinical faculty may be appointed with a renewable long-term contract. Interested candidates should send a current *vita* and a letter of interest before January 15, 2007 to: Joe Fisher, Chair, Department of Accounting, 1309 E. 10th Street, Bloomington, IN 47405-1701; Email: jofisher@indiana.edu.

203 INDIANA UNIVERSITY, Department of Accounting, invites applications for a tenure-track faculty position at the Assistant/Associate Professor rank effective Fall 2007. Candidates must possess a doctoral degree and have a strong commitment to excellence in scholarly research and teaching. Compensation levels are competitive and negotiable. Interested candidates should send a current *vita*, a research paper suitable for presentation at a workshop, and evidence of teaching ability to the contact person indicated below. Three letters of reference will also be required before an offer of employment can be considered. Applications received before January 1, 2007 will be given full consideration. Send to: Joe Fisher, Chair, Department of Accounting, Kelley School of Business, 1309 E. 10th Street, Bloomington, IN 47405-1701; Email: jofisher@indiana.edu. Minorities, women, and persons with disabilities are encouraged to apply.

204 EDGEWOOD COLLEGE, located in Madison, WI, invites nominations and applications for the position of Dean of the School of Business. The successful candidate will be a creative, innovative, visionary leader, whose outstanding level of past achievement is matched by his or her potential for future success. The Dean's role is to provide leadership and vision for the School of Business as it continues to build upon its recent successes in obtaining ACBSP accreditation, expansion of its doctorally qualified faculty, growth in its Returning Adult Accelerated Degree program, improved self-assessment, and continuous improvement of the M.B.A. program. This position reports to the Vice President of Academic Affairs. The Dean is responsible for the operation of the School of Business, including fundraising, budget, personnel, curriculum, and planning matters. The Dean must actively support the mission of the College by working with faculty, staff and students to share in our core values: truth, compassion, justice, partnership, and community. Review of applicants will begin December 18, 2006. A complete description of the position may be found at: http://employment.edgewood.edu/staff_table2.htm.

205 OREGON STATE UNIVERSITY invites applicants for a tenure-track position in Accounting at the rank of Assistant or Associate to begin September 2007, subject to funding. Teaching duties will be in auditing, and financial or managerial accounting. Responsibilities include research, teaching, and professional activities in the field of accounting. Candidates should hold the appropriate doctorate. Professional certification is desirable. Salary is competitive, fringe benefits are excellent. Oregon State University is located in Corvallis, rated the second best small city in America. Qualified candidates are invited to electronically submit an application at: http://oregonstate.edu/jobs/ including a letter of interest, current *vita*, recent teaching evaluations, evidence of scholarly work, and a list of three references. Applications may also be mailed to: Dr. Roger Graham, College of Business, 200 Bexell Hall, Oregon State University, Corvallis, Oregon 97331-2603. For full consideration apply by January 15, 2007. OSU is an Equal Opportunity Employer and seeks diversity.

206 POSITION DESIRED. Available: Summer 2007 or later. Ph.D., CPA, CMA, and academically qualified with recent service at two institutions through successful AACSB accreditations (both school and department). Publications and working papers: tax, financial, and managerial accounting. Primary teaching: managerial/cost at both grad and undergrad (with consistently superior teaching evaluations). Secondary teaching: tax and financial at both grad and undergrad. Preference: institution with reasonable commute or temporary relocation from central Pennsylvania, and market-based compensation package and teaching load. Email: Holley57@netzero.com.

207 FORDHAM UNIVERSITY, Schools of Business, invite applications for several positions, resources permitting, for visiting and tenure-track Assistant/Associate Professors in Accounting and Taxation starting in the Fall 2007. The candidates must have received an earned doctorate in Accounting or a related area or be near completion of degree before August 2007 and have a strong commitment to teaching and research. Candidates for Associate Professor must have a record of success in research and teaching. Applications should include a *curriculum vitae*, three letters of reference, and an example of scholarly work and be sent to: Professor Allen Schiff, Accounting Area Chair, Fordham University, 113 West 60th Street, New York, NY 10023; Email: Schiff@fordham.edu; Fax: (212) 765-5573. Fordham Business Schools are accredited by the AACSB. Fordham is an independent, Catholic university in the Jesuit tradition that welcomes applications from men and women of all backgrounds. Fordham University is an Affirmative Action/Equal Opportunity employer.

208 SENIOR ACCOUNTANT needed to: reconcile and bill all patient, supplier and insurance provider accounts; prepare accounting records, financial reports and financial statements. Use of Adv. Excel, Quick Books, and Medical Billing Software. Req: M.B.A. + 1 yr. exp. w/medical accounting and fluency in Spanish. Resumes to: Serrano Medical Services, Dr. Carlos J. Serrano, 37-22 88th St., Jackson Heights, NY 11372.

209 KEISER COLLEGE seeks graduate faculty members in the academic disciplines of Managerial Economics, International Business, Management, Accounting as well as Marketing. An earned D.B.A. or Ph.D. in Business with a related discipline from a regionally accredited institution is required. While young scholars will be considered, favored candidates will have had previous teaching experience, preferably at the graduate level. A strong and recent a record of presentations, research activities, and publications is required. Continued scholarly activity is expected. The institution is offering a competitive salary and benefit package. Resumes, with cover letter and other supporting documentation, should be sent to: Lawrence Wang Ph.D. at: lwang@keisercollege.edu.

210 TEXAS CHRISTIAN UNIVERSITY, M. J. Neeley School of Business, Department of Accounting, invites applications for a tenure-track faculty position at the Assistant or Associate Professor rank starting Fall 2007. Teaching duties will be in financial accounting and/or taxation. A Ph.D. is required and demonstrated excellence in research and teaching are preferred. TCU offers an excellent environment for faculty. Research resources include access to a variety of databases including the Wharton Research Data Service. The Neeley School offers B.B.A., M.B.A., and M.Acc. degree programs. All programs enjoy business and accounting accreditation from AACSB International. See our website at http://www.TCU.edu for more information. Send *vita*, recent working paper, and three letters of reference to: Robert L. Vigeland, Department of Accounting, M. J. Neeley School of Business, Texas Christian University, TCU Box 298530, Fort Worth, TX 76129. Email: b.vigeland@tcu.edu. TCU is an Affirmative Action/Equal Opportunity Employer.

211 BOWLING GREEN STATE UNIVERSITY invites applicants for visiting positions in Accounting at the Assistant, Associate, or Full Professor rank beginning in August 2007. We are looking for one or more individuals to support our undergraduate specialization in Accounting, our Master of Accountancy program and our M.B.A. programs. Accounting Ph.D. is preferred, but ABDs nearing completion are encouraged to apply. Visiting appointments for one academic year are preferred ,but semester appointments will be considered. These visiting appointments may lead to consideration for full-time tenure-track positions. BGSU offers a competitive salary package based upon experience and record. Applicants should send a current resume and three professional references that our search committee may contact to: Dr. Lawrence W. Kowalski, Chair, Department of Accounting and MIS, Bowling Green State University, Bowling Green, OH 43403-0250; Email: lkowals@cba.bgsu.edu. Screening will begin on January 8, 2007 and will continue until the position(s) is filled. Information on departmental programs and faculty can be reviewed at: http://www.cba.bgsu.edu/amis. Bowling Green State University is an Equal Employment Opportunity/Affirmative Action employer and encourages applicants from women, minorities, veterans, and individuals with disabilities.

212 EDGEWOOD COLLEGE, School of Business, invites applications for a tenure-track position in Accounting starting in Fall 2007. The individual in this position will teach three or four sections of undergraduate/graduate Accounting courses per semester along with research/scholarly activities (including consulting), advising, and service. Primary teaching and research interests in Audit, Financial, or Cost. A high-quality earning environment is the primary consideration at Edgewood, although a record of and promise to produce refereed Accounting publications is also important. Edgewood maintains small class size limits, providing the opportunity for faculty to work closely with students. Edgewood College is a private Catholic liberal arts college of 2,400 students, accredited by the ACBSP and located in Madison, Wisconsin. The Accounting program in the School of Business recruits and develops individuals who aspire to be Partner, C-level, and VP-level leaders in the best middle-market firms in the Midwest. Requirements: Ph.D. in Accounting or J.D. is required. Professional experience and certification (e.g., CPA, CMA) is preferred. Salary will depend on qualifications. Specific questions can be directed to Dr Ken Macur: Email: kmacur@edgewood.edu; Phone: (608) 663-4216. The position will remain open until filled. Interested applicants should send cover letter, resume, and references to: Edgewood College Human Resources—ACCT, 1000 Edgewood College Drive, Madison, WI 53711; Fax: (608) 663-3295. See: http://employment.edgewood.edu. Equal Opportunity Employer.

213 UNIVERSITY OF HAWAII AT MANOA, School of Accountancy, Shidler College of Business, invites application for two tenure-track faculty positions at the Assistant, Associate or Full Professor rank to begin August 1, 2007. For full job descriptions, please go to: http://workatuh.hawaii.edu. Submit a letter of application, current *vita*, and contact information of at least three references to: Dr. Shirley Daniel, University of Hawaii at Manoa, Shidler College of Business, School of Accountancy, 2404 Maile Way, C-306, Honolulu, Hawaii 96822. Representatives will attend FARS and Auditing Section midyear meetings and will be happy to meet with applicants. UH is an Equal Opportunity Employment/Affirmative Action Institution.

214 UNIVERSITY OF NORTH CAROLINA AT GREENSBORO, Department of Accounting and Finance, Bryan School of Business and Economics, announces a tenure-track faculty position in Accounting at the Senior Assistant, Associate, or Full Professor level beginning August 2007. Teaching responsibilities will be in the areas of either auditing or information systems and/or financial accounting at both the undergraduate and M.B.A./M.S.A. level. The department seeks candidates with demonstrated achievements and potential for continuing professional growth. The successful candidate will possess qualities of a faculty leader in both the department and Bryan School. Candidates are expected to have an active research agenda leading to publications in quality, refereed academic and professional journals. A history of significant interactions with business and accounting professionals is strongly desired. Service to the department, school, and university is a component of faculty responsibilities and includes curriculum and program development and evaluation, and participation in faculty seminars. The Bryan School offers opportunities in executive education through the Office of Professional Development Programs. Review of applications will continue until the position is filled. Contact: Dr. Tony Wingler, Department of Accounting and Finance, Bryan School of Business and Economics, UNCG, PO Box 26165, Greensboro, North Carolina 27402-6165; Email: Tony_Wingler@uncg.edu. EEO/AA.

215 UNIVERSITY OF WASHINGTON, Bothell Business Program, invites applications for a tenure-eligible Assistant Professor or Associate Professor with tenure in Accounting for Fall 2007. Applicants must have a Ph.D. in Accounting, an established record of publications and demonstrated excellence in teaching. The successful candidate will be responsible for spearheading the effort to start an Accounting option or major within the Business Program. The successful candidate will teach undergraduate and M.B.A.-level courses. To apply please send a letter describing your qualifications, a statement of your research interests and teaching philosophy. Include your *CV*, teaching evaluations, one research paper. and three letters of reference. Complete applications received by January 5, 2007 will receive priority consideration. For more information, visit: http://www.uwb.edu/bus. To apply by email, please send a letter of application, *CV*, and a list of three references to: BASearch@u.washington.edu.

216 NORTH CAROLINA STATE UNIVERSITY, Department of Accounting, invites applicants for a tenure-track position for Fall 2007. A specialization in Accounting Information Systems is preferred and a doctorate (or short-term ABD status) in Accounting from an AACSB-accredited university is required. The academic rank is open and the salary competitive. NC State is a land-grant institution located in one of the ten best cities to live and work in according to Cityrating.com. The College of Management boasts 2,800 students and offers an undergraduate and graduate degree in Accounting. Please send letter of interest and *curriculum vita* directly to: Recruiting Coordinator, Department of Accounting, North Carolina State University, Campus Box 8113, Raleigh, NC 27695-8113. Inquires and ADA accommodations can be made via email to: acctrecruiting@ncsu.edu. AA/EOE. NC State welcomes all persons without regard to sexual orientation.

217 TEXAS A&M UNIVERSITY, CORPUS CHRISTI, Department of Accounting and Business Law in the College of Business, invites applications for two tenure-track Assistant/Associate Professor positions beginning Fall 2007, subject to final budgetary approval. We are primarily interested in candidates who have a teaching interest in financial accounting or auditing. Applicants should possess a doctoral degree in accounting from an AACSB-accredited institution and demonstrate a strong commitment to scholarly research and teaching excellence. Certification and professional experience are preferred. Salary is competitive. Please send applications to: Donald R. Deis, Search Committee Chair, College of Business, Texas A&M University-Corpus Christi, 6300 Ocean Drive, Unit # 5808, Corpus Christi, Texas 78412-5808; Email: Donald.Deis@tamucc.edu. For more information on the positions, the University, and the College go to: http://www.cob.tamucc.edu. The College of Business undergraduate and graduate business programs are accredited by AACSB International. TAMUCC is an AA/EEO employer committed to excellence (http://www.tamucc.edu/~hrweb/).

218 UNIVERSITY OF MEMPHIS invites applications for Director of the School of Accountancy, effective Fall 2007. The Director provides academic and administrative leadership for faculty recruitment and development, curriculum, research initiatives, course scheduling, budgeting, staff supervision, and external relationships. The School has 19 full-time faculty and includes two Chairs of Excellence. The School offers the B.B.A., M.S., and Ph.D. programs and is accredited by AACSB. Qualifications include earned doctorate in accounting, appropriate professional certification (CPA, CMA, CIA), established record of scholarship, effective leadership and communication skills, ability to interact effectively with external constituencies, and credentials appropriate to a senior appointment. Compensation is AACSB competitive. Applicants should send cover letter, *curriculum vitae*, statement of administrative philosophy, and contact information for three professional references to: Dr. Thomas Miller, Associate Dean, Fogelman College of Business and Economics, The University of Memphis, Memphis, TN 38152; Phone: 901-678-4563; Email: thmiller@memphis.edu. Screening of applications will begin January 15, 2007. An Equal Opportunity/Affirmative Action employer.

219 UNIVERSITY OF SYDNEY, Accounting Discipline has openings for Lecturers or Senior Lecturers. Applicants must have a Ph.D. in accounting, be near completion of a Ph.D. in Accounting, or have equivalent experience. Teaching excellence is required, as well as an aptitude for research and an interest for publication. It is essential that candidates have expertise in one or more of the major areas of accounting including financial accounting, in both the public and private sectors, corporate governance, international accounting, management accounting, social and environmental accounting and auditing. For further information on the position and remuneration packages or to apply online, go to: http://positions.usyd.edu.au. Specific enquiries about the role can be directed to Professor James Guthrie, Chair of the Discipline of Accounting; Phone: +61 2 9036 6236; Email: j.guthrie@econ.usyd.edu.au.

220 UTAH VALLEY STATE COLLEGE, Accounting Department has a tenure-track opening beginning Fall 2007. The position requires a Ph.D. or D.B.A. from an AACSB-accredited business school prior to the starting date; ABDs nearing completion will be considered. Preference will be given to candidates with teaching interests in Financial Accounting, Managerial Accounting, Accounting Information Systems, and Auditing. All ranks will be considered. Good teaching and research skills are required. The School of Business was recently awarded AACSB accreditation and offers undergraduate degrees to 4,000 majors with 600 accounting majors. UVSC is one of the nation's fastest-growing comprehensive four-year institutions with 24,000 students. The campus is located in the beautiful Wasatch mountains, 45 minutes from downtown Salt Lake City, with access to high-quality cultural events and outstanding outdoor activities. Screening of applicants will continue until the position is filled. Quicklink to the job announcement is found at: http://www.uvsc.jobs/applicants/Central?quickFind=51569.

221 CENTRAL MICHIGAN UNIVERSITY, College of Business Administration, is accepting applications for a recently approved tenure-track Assistant/Associate Professor position in accounting starting in August 2007. Principal responsibilities include teaching undergraduate and graduate courses in accounting. Normal teaching load is nine credit hours per semester. Required: A doctorate from an AACSB-accredited school with a major in Accounting, or ABD and in the final stages of dissertation completion; evidence of teaching excellence in accounting courses at the university level; and a strong research agenda. Application review commences immediately and continues until the position is filled. Please mail application letter, resume, and three references to: Dr. Philip Kintzele, Chair, School of Accounting, Central Michigan University, 312 Grawn Hall, Mt. Pleasant, MI 48859; Phone (989) 774-3796; Fax (989) 774-3999. For full job announcement, see: http://www.fps.cmich.edu/jobs. CMU, an AA/EO institution, strongly and actively strives to increase diversity within its community (see: http://www.cmich.edu/aaeo/).

222 UNIVERSITY OF CALIFORNIA, DAVIS, Graduate School of Management invites applications for one tenure-track position in Accounting. The position will be filled at the Assistant Professor level. Applications should demonstrate excellence or potential excellence in research in any area of accounting. The ideal candidate will also demonstrate excellence or potential excellence in teaching managerial accounting. Candidates should have a Ph.D. in accounting or related field. Letter of application should describe research and teaching interests and include a resume, evidence of research, teaching, and the names and addresses of three references to: Faculty Search Committee, UC Davis, Graduate School of Management, One Shields Ave., Davis, CA 95616; Email: FacultyRecruit@gsm.ucdavis.edu This position will remain open until filled. The University of California is an Affirmative Action/Equal Opportunity Employer with a strong institutional commitment to the achievement of diversity among its faculty and staff.

223 COLLEGE OF WILLIAM & MARY, Mason School of Business is continuing the search for one or two tenure-track positions in accounting at the Assistant or Associate Professor level beginning in Fall 2007. Candidates at the Assistant level must have a doctoral degree or be near completion. Candidates at the Associate level must have a doctoral degree and a demonstrated ability to publish high-quality research. Commitment to excellence in both teaching and research is essential. Applicants in the areas of financial accounting and/or managerial accounting are especially encouraged, as are those able to teach at both the undergraduate and graduate levels. Information about the school can be found at: http://mason.wm.edu/. Please send *curriculum vita,* three letters of reference, teaching evaluations and samples of scholarly work via email to: Search Coordinator—Accounting School of Business Administration, College of William & Mary, PO Box 8795, Williamsburg, VA 23187-8795; Email: searches@mason.wm.edu. Review begins July 15, 2006 and will continue until an appointment is made. The College is an EO/AA Employer.

224 BOCCONI UNIVERSITY (Milan, Italy), Institute of Accounting, Finance and Control invites applications for Assistant Professor positions in the areas of Financial Accounting and Managerial Accounting effective from the 2007–2008 academic year. Job Requirements: Applicants should have—or be close to completing—a Ph.D. Responsibilities include both teaching at the undergraduate and graduate level and research. Teaching is required on the following topics: financial accounting according to IAS/IFRS, consolidation accounting, management accounting, performance measurement systems. Applicants should have proof of having established potential in conducting scholarly research aimed at publications in high-quality international journals. Salary is in line with other leading academic institutions in Europe. Application Procedure: Please send your current *CV,* two letters of recommendation, recent teaching evaluations (if available), and the list of any scientific publication to: Professor Angelo Ditillo IAFC—Institute of Accounting, Control and Finance, Bocconi University, Piazza Sraffa, 11 20136 Milan, Italy. For further information, email: angelo.ditillo@unibocconi.it. Applications should be received preferably by March 1st, 2007. The evaluations will be carried out on a first-arrival basis.

225 NORTH DAKOTA STATE UNIVERSITY, College of Business, (AACSB) invites applications for a tenure-track position in the Department of Accounting and Information Systems effective August 15, 2007. Rank is open depending on qualifications. Teaching responsibility is in the taxation area. Minimum qualifications: Ph.D. or D.B.A. in accounting with research and teaching potential, (ABD will be considered), good interpersonal skills, demonstrated effective written and verbal communication skills. Preferred qualifications: proven record of publications and teaching. Application Procedure: Send application letter, *vita*, teaching evaluations and name, address, phone number of at least three references to: Dr. Bonnie K. Klamm, Search Committee Chair, PO Box 5075, NDSU, Fargo, ND 58105; Email: bonnie.klamm@ndsu.edu. For more information: http://www.ndsu.edu/ndsu/jobs/non_broadbanded/index.shtml. NDSU is an Equal Opportunity institution.

226 IBMEC SAO PAULO is offering a full-time teaching position in Business Administration, namely in the field of accounting. New hires should start in August 2007. IBMEC São Paulo is a rapidly growing educational institution in Brazil and offers M.A., executive training programs, and undergraduate programs in Business and Economics. Wage and benefits include competitive salary, academic career, support for research and travel, and variable compensation for excellence in research, teaching and institutional contributions. The applicant must have a Ph.D. by the starting date of the job, strong research potential and knowledge of Portuguese. Application deadline: March 30, 2007. Applicants should send *curriculum vitae*, three letters of recommendation, and copies of most recent/relevant research to: IBMEC São Paulo, Recruiting Committee A/C: Rogério Paes Costa Rua Quatá, 300 São Paulo, SP 04546-042 Brazil. Electronic submission can be made by sending an email to: RogerioPC1@isp.edu.br. http://www.ibmecsp.edu.br.

227 SOUTHEASTERN LOUISIANA UNIVERSITY, Hammond, LA invites applications for a tenure-track Accounting position beginning Fall, 2007. Primary need is Financial. Southeastern offers a B.S. in Accounting and a concentration at the M.B.A. level. Candidates should hold a doctorate in accounting from an AACSB-accredited university. Candidates should also demonstrate a strong commitment to teaching (including student advising/mentoring), have a record of peer-reviewed journal articles/or the clear potential to develop such a record (Associates/Assistants), be committed to working with diversity and to service for the department, college, and university. Application material is currently being accepted. To ensure consideration, application materials must be received by February 15, 2007. Qualified applicants should send a letter of application, *vitae*, three current letters of reference and a copy of *all* transcripts (originals required upon employment) to: Dr. Rick Simpson, Department of Accounting, SLU 10468, Hammond, LA 70402; Email: rsimpson@selu.edu. Southeastern is an AA/ADA/EEO employer.

228 STATE UNIVERSITY OF NEW YORK AT BUFFALO, School of Management invites applications for one or more expected accounting faculty openings starting Fall 2007, subject to budgetary approval. Rank and teaching interests are open, but we are especially interested in applicants in the Auditing, Financial, Managerial, and Systems areas. Applicants must demonstrate capacity to undertake scholarly research publishable in leading journals and to provide quality teaching at the undergraduate, M.B.A., and/or Ph.D. level. Doctorate in hand (at the Assistant level) or near completion is expected. A substantial research record is a requirement for senior positions. Salary and fringe benefits are competitive. For consideration, please email *curriculum vitae*, two letters of recommendation, dissertation proposal, other research paper(s), and teaching evaluations to Professor Samuel Tiras: stiras@buffalo.edu. Only electronic applications will be accepted. The search remains open until filled, but please email prior to January 16 for full consideration. SUNY at Buffalo is an Affirmative Action/Equal Opportunity Employer.

229 THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL, Kenan-Flagler Business School is seeking to hire one or more faculty members for a full-time, tenured, tenure-track, or fixed-term position in the Accounting Area. Applicants should be able to teach in at least one of the following areas: Financial Accounting, Managerial Accounting, Taxation, or Auditing. Applicants should have a Ph.D. with an emphasis in accounting and a demonstrated commitment to research. Applicants should have teaching experience as well as significant research accomplishments. All applicants should be able to contribute to the University's teaching mission at the undergraduate, Master of Accounting, M.B.A., Ph.D., and Executive Education levels. Interested individuals should write, enclosing *curriculum vitae*, a sample of research papers, and four letters of recommendation to: Professor Edward Maydew, Chair of Accounting Area, Kenan-Flagler Business School, University of North Carolina at Chapel Hill, McColl Bldg, CB #3490, Chapel Hill, NC 27599-3490. http://www.kenan-flagler.unc.edu/. The University of North Carolina at Chapel Hill is an Equal Opportunity Employer.

CORNERSTONE RESEARCH

FINANCE AND ECONOMICS CONSULTING

Who We Are
Cornerstone Research is a leading economic consulting firm that specializes in analyzing economic, financial, accounting, and marketing issues. Our diverse staff of more than 400 work side by side with nationally prominent faculty who testify as expert witnesses, analyzing complex business issues that arise in litigation.

Cornerstone Research is involved in a broad variety of cases, and our work has involved highly visible events and legal issues. Some of our recent cases have involved securities fraud claims, accounting allegations, options backdating, asset valuation, insider trading allegations, alleged mutual fund market timing, allegations of price fixing and monopolization, patent infringement claims, and large corporate mergers and acquisitions.

Associates and Project Managers at Cornerstone Research
Cornerstone Research provides an interesting and rewarding work environment. Associates and project managers work directly with esteemed faculty experts in a distinctive "partnership" that combines the strengths of the academic and business worlds. Cornerstone Research provides opportunities for associates and managers to develop as testifying experts if they are interested in such a career path.

Associates are central to case work at Cornerstone Research and are involved in all phases of a project. In the initial stages, associates actively participate in the formulation of the work plan and the analysis of issues. As the case progresses, associates handle the complex aspects of a case directly, while managing and advising analysts. They work with senior staff, experts, and clients to develop case strategy and to determine how best to communicate our findings. In addition, associates actively participate in shaping and implementing the firm's recruiting, training, and practice development strategies. Project managers have substantial experience in case work and are directly responsible for formulating work plans and directing all aspects of a case. Cornerstone offers an excellent package of interesting work, exposure to a broad set of issues in accounting, economics, and finance, a high degree of personal responsibility, and competitive compensation.

Candidate Profile
We are interested in hiring candidates for our offices in Boston, MA, Los Angeles, CA, Menlo Park, CA, New York, NY, San Francisco, CA and Washington, DC. We seek accounting Ph.D. candidates with the ability to apply academic research to real world issues, present concise explanations of complex analyses, and independently manage projects and junior staff. Positions are available for candidates currently completing their Ph.D. program, as well as for more senior candidates with additional private sector or academic work experience. The ideal candidate will possess a strong empirical background in Financial Accounting, Cost Accounting, or Auditing, technical expertise in accounting, and excellent interpersonal skills. CPAs are strongly encouraged to apply. Compensation commensurate with experience.

Interested candidates should send a cover letter that includes a statement describing your interest in economic consulting and location preference, a resume, a sample research paper, and letters of reference via e-mail to associate-recruiting@cornerstone.com or to:
Recruiting Coordinator – AR
Cornerstone Research
1000 El Camino Real Suite 250
Menlo Park, CA 94025 (Web page: http://www.cornerstone.com)

CORNERSTONE RESEARCH
FINANCE AND ECONOMICS CONSULTING

Who We Are
Cornerstone Research is a leading economic consulting firm that specializes in analyzing economic, financial, accounting, and marketing issues. Our diverse staff of more than 400 work side by side with nationally prominent faculty who testify as expert witnesses, analyzing complex business issues that arise in litigation.

Cornerstone Research is involved in a broad variety of cases, and our work has involved highly visible events and legal issues. Some of our recent cases have involved securities fraud claims, accounting allegations, options backdating, asset valuation, insider trading allegations, alleged mutual fund market timing, allegations of price fixing and monopolization, patent infringement claims, and large corporate mergers and acquisitions.

Associates and Project Managers at Cornerstone Research
Cornerstone Research provides an interesting and rewarding work environment. Associates and project managers work directly with esteemed faculty experts in a distinctive "partnership" that combines the strengths of the academic and business worlds. Cornerstone Research provides opportunities for associates and managers to develop as testifying experts if they are interested in such a career path.

Associates are central to case work at Cornerstone Research and are involved in all phases of a project. In the initial stages, associates actively participate in the formulation of the work plan and the analysis of issues. As the case progresses, associates handle the complex aspects of a case directly, while managing and advising analysts. They work with senior staff, experts, and clients to develop case strategy and to determine how best to communicate our findings. In addition, associates actively participate in shaping and implementing the firm's recruiting, training, and practice development strategies. Project managers have substantial experience in case work and are directly responsible for formulating work plans and directing all aspects of a case. Cornerstone offers an excellent package of interesting work, exposure to a broad set of issues in accounting, economics, and finance, a high degree of personal responsibility, and competitive compensation.

Summer Candidate Profile
We are interested in hiring candidates for our offices in Boston, MA, Los Angeles, CA, Menlo Park, CA, New York, NY, San Francisco, CA and Washington, DC. We seek accounting Ph.D. candidates expecting to graduate in 2008 who would like an opportunity to learn about economic consulting. We also consider former accounting Ph.D. graduates who are interested in a career change. We seek candidates with the ability to apply academic research to real world issues, present concise explanations of complex analyses, and independently manage projects and junior staff. The ideal candidate will possess a strong empirical background in financial accounting, cost accounting, or auditing, technical expertise in accounting, and excellent interpersonal skills. Compensation commensurate with experience.

Interested candidates should send a cover letter that includes a statement describing your interest in economic consulting and location preference, a resume, a sample research paper, and letters of reference via e-mail to associate-recruiting@cornerstone.com or to:
Recruiting Coordinator – AR
Cornerstone Research
1000 El Camino Real Suite 250
Menlo Park, CA 94025 (Web page: http://www.cornerstone.com)